Factors Influencing Antihypertensive Medication Adherence Among Elderly Patients: A Cross-Sectional Study in Sesayap Hilir, North Kalimantan

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ABSTRACT

Hypertension is a chronic condition frequently accompanied by low medication adherence in older adults, contributing to elevated risks of cardiovascular complications. This study aimed to identify the factors influencing medication adherence among elderly patients with hypertension in the working area of the Sesayap Hilir Public Health Center, Tana Tidung Regency. A cross-sectional design was applied involving 258 participants selected through purposive sampling. Data were collected using the 8-item Morisky Medication Adherence Scale (MMAS-8) and a structured questionnaire with researcher-developed items to evaluate predisposing, enabling, and reinforcing factors, and were analyzed using chi-square tests and factor analysis. Most participants demonstrated low adherence (81%), had primary-level education, reported family income below the regional minimum wage, and had lived with hypertension for at least three years. No significant associations were found between medication adherence and education level ($p = 0.388$), employment status ($p = 0.364$), family income ($p = 0.082$), or hypertension duration ($p = 0.657$). In contrast, knowledge ($p < 0.001$), family support ($p < 0.001$; PR = 24.65), and motivation ($p < 0.001$; PR = 21.93) were strongly associated with adherence. Factor analysis identified two significant components: psychosocial resources (knowledge, family support, motivation) and demographic–disease factors (education, occupation, illness duration), which together explained 64.45% of the total variance. These findings indicate that psychosocial resources are the predominant determinants of medication adherence among elderly patients with hypertension. Interventions at the primary care level should therefore prioritize strengthening health literacy, enhancing family involvement, and maintaining patient motivation to support long-term treatment adherence.

Keywords: hypertension, elderly, medication adherence, knowledge, family support

Introduction

Hypertension remains one of the most prevalent chronic non-communicable diseases worldwide. It is recognized as a significant risk factor for cardiovascular events such as myocardial infarction, heart failure, stroke, and chronic kidney disease. According to the World Health Organization, cardiovascular diseases were the leading cause of global mortality in 2017, with hypertension contributing substantially to this burden. (WHO, 2017). The global prevalence of hypertension continues to rise, with the highest rates reported in Africa (46% among adults aged ≥25 years) and lower rates in the Americas (35%) (Harahap et al., 2018). By 2025, it is projected that 1.56 billion individuals will be living with hypertension, with approximately 9.4 million deaths annually attributed to hypertension-related complications

(WHO, 2023). In Indonesia, the increase in cases of hypertension mirrors global trends. The Ministry of Health reported a prevalence of 34.1% in 2019, rising from 25.8% in 2013 (Kemenkes RI, 2019). A similar upward pattern is observed in Kalimantan Utara, where 221,095 cases were recorded in 2018, and more recent local data indicate 530 hypertensive cases among older adults in the Sesayap Hilir health service area during 2023–2024 (Adiyasa & Meiyanti, 2021).

Medication adherence is central to effective hypertension management, particularly among older adults. Failure to adhere to antihypertensive therapy increases the risk of severe complications, worsens quality of life, and contributes to the escalating burden on healthcare systems. (Suyasa, PhD et al., 2024). However, adherence remains suboptimal globally, with studies reporting that fewer than half of hypertensive patients in low- and middle-income countries adhere to long-term therapy. (Soesanto et al., 2021). Older adults face unique challenges that complicate treatment adherence, such as declining cognitive function, sensory limitations, polypharmacy, mobility constraints, and the presence of multiple comorbidities. In Indonesia, similar patterns are evident, with many older individuals reducing or discontinuing treatment due to limited understanding of disease severity, misperceptions regarding medication needs, and inconsistent supervision by healthcare providers. (Mardhiati et al., 2023).

A substantial body of research has highlighted the influence of socioeconomic, clinical, and psychosocial determinants on medication adherence among older adults. Lower educational attainment may impede comprehension of hypertension risks and the importance of lifelong therapy, while financial constraints limit access to medications and routine healthcare. (Utari et al., 2021). The extended duration of illness does not necessarily translate into better adherence; instead, chronicity may lead to treatment fatigue or complacency, with forgetfulness, medication costs, and complex dosage schedules frequently cited as reasons for non-adherence (Ali et al., 2025). Knowledge about hypertension is a consistent predictor of adherence, as individuals with greater awareness of long-term consequences are more likely to engage in regular medical follow-up. A study in Jakarta found that only 32% of hypertensive patients attended routine clinical visits, and adherence was significantly associated with knowledge level, illness duration, family support, and engagement with healthcare professionals. (Mardhiati et al., 2023). Among these determinants, family support is among the strongest predictors of adherence. Emotional encouragement, assistance with medication management, accompaniment to medical appointments, and financial support from family members significantly improve adherence. (Pristianti et al., 2023). Evidence from Puskesmas

Simpang Tiga Pekanbaru showed that older adults with strong family support were substantially more adherent to antihypertensive therapy compared to those with limited support. (Nurannisa et al., 2022). Collectively, these findings illustrate that a complex interplay among socioeconomic status, illness duration, knowledge, motivation, and family engagement shapes adherence.

Understanding these factors within specific local contexts is particularly important for primary healthcare centers, which serve as the frontline for chronic disease management. Puskesmas Sesayap Hilir, located in Kabupaten Tana Tidung, Kalimantan Utara, plays a strategic role in promotive, preventive, curative, and rehabilitative services, especially for non-communicable diseases affecting older populations. Despite ongoing community-based hypertension management programs, adherence rates in this region remain low, with only about half of older adults consistently attending follow-up visits or taking antihypertensive medication as prescribed. The area's demographic and socioeconomic characteristics, including heterogeneous educational levels, income disparities, and limited access to healthcare, highlight the need for in-depth, context-specific analysis. The persistent challenge of low adherence reflects gaps in behavioral, informational, and family support systems that existing interventions have not yet fully addressed.

Given these circumstances, a comprehensive investigation into the factors influencing medication adherence among older hypertensive patients in the Sesayap Hilir health service area is essential. Such evidence is crucial for designing targeted and culturally relevant interventions that can be integrated into primary care services to improve long-term hypertension control. Therefore, this study aims to analyze sociodemographic, clinical, psychosocial, and familial determinants of medication adherence among older adults with hypertension at Puskesmas Sesayap Hilir, using the 8-item Morisky Medication Adherence Scale (MMAS-8) as the primary instrument for measuring adherence. Findings from this study are expected to provide an evidence base for strengthening community-level hypertension management strategies.

Materials and Methods

Study Design and Population

A cross-sectional study was conducted among older adults diagnosed with hypertension in the catchment area of Puskesmas Sesayap Hilir, Tana Tidung Regency, North Kalimantan, Indonesia. Data collection was carried out throughout 2024. The independent variables assessed in this study included education level, employment status, family income, duration of

hypertension, knowledge, family support, and motivation. The dependent variable was adherence to antihypertensive medication, measured using the 8-item Morisky Medication Adherence Scale (MMAS-8) (Suyasa, et al., 2024). This instrument was selected because it is one of the most widely validated tools for assessing antihypertensive medication adherence, has strong psychometric properties, is practical for use in community-based settings, and is appropriate for populations with varying literacy levels, including older adults.

Sample Size Calculation

The study population consisted of 530 registered older adults with hypertension in the Puskesmas database. The minimum required sample size was determined using the Slovin formula with a 5% margin of error, yielding 235 participants. An additional 10% was added to account for potential non-response, bringing the final target to 258 participants. Participants were selected using convenience sampling. Inclusion criteria were: age ≥ 60 years, physician-diagnosed hypertension, current use of antihypertensive medication, and ability to communicate and provide informed consent. Exclusion criteria included severe cognitive impairment, acute medical conditions requiring emergency care, or inability to complete the interview.

Data Collection

Data were collected through structured face-to-face interviews conducted at the health center and during home visits for participants with limited mobility. Trained enumerators administered a standardized questionnaire capturing sociodemographic characteristics, clinical history, and psychosocial determinants. Medication adherence was assessed using the MMAS-8, which classifies participants into adherent and non-adherent categories based on established cut-off scores. Knowledge, family support, and motivation were measured using validated Likert-scale instruments adapted from previous Indonesian studies. Prior to full implementation, all instruments were pilot-tested on 20 older adults in a similar setting. Construct validity was evaluated using Pearson's correlation coefficients, and internal consistency reliability was assessed using Cronbach's alpha, with $\alpha \geq 0.70$ considered acceptable.

Study Variables

The primary outcome was medication adherence (adherent vs. non-adherent) as measured by MMAS-8 scores. Independent variables included: sociodemographic

characteristics (age, sex, education level, employment status, and family income). Clinical characteristics: duration of hypertension (<3 years vs. ≥3 years) and type of antihypertensive therapy. Psychosocial factors: knowledge (poor, adequate, sound), family support (supportive vs. unsupportive), and motivation (low vs. high). Categorization of variables followed national guidelines and previous empirical studies conducted in Indonesian older adult populations.

Data Analysis

Descriptive analyses were performed to summarize participant characteristics, presented as frequencies and percentages. Associations between independent variables and medication adherence were examined using Chi-square tests, and effect sizes were expressed as prevalence ratios (PR) with 95% confidence intervals. To identify the underlying constructs influencing adherence, exploratory factor analysis (EFA) was conducted using principal component analysis with varimax rotation. Factors with eigenvalues >1.0 were retained, and items with factor loadings ≥0.40 were included in the interpretation. Statistical significance was set at $p < 0.05$ for all analyses.

Ethical Approval

This study was reviewed and approved by the Institutional Ethics Committee of the Faculty of Medicine, Universitas Jenderal Achmad Yani (Approval No. 171/KEPK/FITKes-Unjani/VII/2025). Participation was voluntary, and confidentiality of personal data was ensured. Written informed consent was obtained from all participants.

Results and Discussion

General characteristics of participants

According to Table 1, the analysis showed no significant associations between demographic factors and medication adherence. Educational status was not related to adherence ($p = 0.388$), with similar distributions of low and moderate adherence among participants with and without formal education (PR = 0.76; 95% CI: 0.41–1.42). Employment status also showed no significant relationship ($p = 0.364$), as both working and non-working participants exhibited comparable adherence patterns (PR = 0.73; 95% CI: 0.37–1.44). Family income demonstrated a non-significant trend toward better adherence among participants with income ≥ UMR ($p = 0.082$; PR = 0.45; 95% CI: 0.18–1.13). Duration of hypertension similarly showed no significant association ($p = 0.657$; PR = 0.82; 95% CI: 0.33–2.01).

Table 1. Demographic and participant characteristics stratified by medication adherence level.

Characteristics	Total (%)	Adherence (%)		PR (95% CI)	p-value
		Low	Medium		
All participants	258 (100)	209 (81)	49 (19)		
Employment Status					
Not working	88 (34.1)	135 (52.3)	35 (13.6)	0.73	0.364
Working	170 (65.9)	74 (28.7)	14 (5.4)	(0.37-1.44)	
Education Level					
No formal education	107 (41.5)	84 (32.6)	23 (8.9)	0.76	0.388
Formal	128 (58.5)	125 (48.4)	26 (10.1)	(0.41-1.42)	
Household Income					
< regional minimum wage	202 (78.6)	159 (61.9)	43 (16.7)	0.45	0.082
≥ Regional minimum wage	55 (21.4)	49 (19.1)	6 (2.3	(0.18-1.13)	
Knowledge Level					
Poor	101 (39.1)	99 (38.4)	2 (0.8)	-	<0.001*
Fair	41 (15.9)	38 (14.7)	3 (1.2)		
Good	116 (45)	72 (27.9)	44 (17.1)		
Family Support					
Not supportive	109 (42.2)	107 (41.5)	2 (0.8)	24.65	<0.001*
Supportive	149 (57.8)	102 (39.5)	47 (18.2)	(5.83-104.14)	
Motivation Level					
Low	126 (48.8)	123 (47.7)	3 (1.2)	21.93	<0.001*
High	132 (51.2)	86 (33.3)	46 (17.8)	(6.6-72.8)	
Duration of Hypertension					
< 3 years	32 (12.4)	25 (9.7)	7 (2.7)	0.82	0.657
≥ 3 years	226 (87.6)	184 (71.3)	42 (16.3)	(0.33-2.01)	
Type of Therapy					
Medical therapy	97 (37.6)	62 (24)	35 (13.6)	-	N/A
Traditional therapy	6 (2.3)	5 (1.9)	1 (0.4)		
Combination therapy	155 (60.1)	142 (55)	13 (5)		

Psychosocial factors were significantly associated with adherence. Knowledge level showed a strong association ($p < 0.001$), with higher knowledge corresponding to greater adherence. Family support was also a strong predictor ($p < 0.001$), as participants receiving support demonstrated substantially better adherence (PR = 24.65; 95% CI: 5.83–104.14). Likewise, high motivation was strongly linked to improved adherence ($p < 0.001$), with motivated participants showing markedly better adherence outcomes (PR = 21.93; 95% CI: 6.6–72.8).

Factor analysis results indicated acceptable sampling adequacy (Table 2), with a KMO value of 0.685, exceeding the minimum threshold of 0.60. Bartlett's Test of Sphericity was significant ($p < 0.001$), confirming that the correlation matrix was suitable for factor extraction and that the variables were sufficiently interrelated to proceed with exploratory factor analysis.

Table 2. Factors associated with medication adherence factor analysis (EFA).

		Statistics
KMO Measure of Sampling Adequacy		0.687
Bartlett's Test of Sphericity	Approx. Chi-Square	368.74
	df	21
	Sig.	<0.001*

Table 3. Communalities value after extraction

Variable	Communalities (Extraction)	MSA
Education Level	0,498	0,621
Duration of Hypertension	0,497	0,621
Knowledge Level	0,714	0,753
Family Support	0,738	0,715
Motivation Level	0,781	0,679
Employment Status	0,639	0,569

Most variables demonstrated acceptable individual sampling adequacy, with MSA values above 0.50, indicating suitability for inclusion in the factor analysis. The highest MSA value was observed for Knowledge (0.753), reflecting a substantial contribution to the factor structure. In contrast, Family income had a very low MSA value (0.038), indicating that it did not meet the minimum adequacy requirement and was therefore excluded from the factor extraction process. Based on the communalities presented in Table 3, all retained variables had values above 0.40, indicating that the extracted factors explained a substantial proportion of each variable's variance. The highest communality value was found for Motivation (0.781), indicating that the underlying factor solution accounted for 78.1% of the variance in the motivation construct.

Table 4. Extracted Factors and Percentage of Variance Explained

Factor	Eigenvalue	% Variance	Total % Varians
1	2,272	37,86%	37,86%
2	1,595	26,59%	64,45%

Based on the results in Table 4, two main factors were successfully extracted, each with an eigenvalue greater than 1. The first factor had an eigenvalue of 2.272 and accounted for 37.86% of the total variance, while the second factor had an eigenvalue of 1.595 and explained an additional 26.59% of the variance. Together, these two factors explained 64.45% of the total

variance, indicating that the extracted factor structure provides a sufficiently representative summary of the observed variables.

Table 5. Rotated Component Matrix

Variable	Factor 1	Factor 2
Education Level	0,113	0,696
Duration of Hypertension	0,035	-0,704
Knowledge Level	0,844	0,048
Family Support	0,859	0,029
Motivation Level	0,884	0,014
Employment Status	0,003	0,799

Note: Factor 1 represents Psychosocial Resources, comprising knowledge, family support, and motivation, each of which demonstrates strong positive loadings. Factor 2 represents Demographic and Disease-Related Factors, including education, duration of hypertension (with a negative loading indicating an inverse relationship), and employment status. The two extracted factors together accounted for 64.45% of the total variance.

Based on the analysis presented in Table 5, two principal factors were identified. Factor 1 (Psychosocial Resources) consisted of the variables *knowledge* (0.844), *family support* (0.859), and *motivation* (0.884), all of which demonstrated high factor loadings. This indicates that Factor 1 represents psychosocial constructs that strongly influence medication adherence among older adults with hypertension. Factor 2 (Demographic and Disease-Related Factors) included the variables *education* (0.696), *duration of hypertension* (−0.704), and *employment status* (0.799). The negative loading on hypertension duration suggests an inverse relationship with this factor. Collectively, Factor 2 reflects demographic characteristics and clinical conditions associated with hypertension management. The factor analysis identified two meaningful latent constructs, psychosocial resources and demographic/disease-related factors, which together explained 64.45% of the total variance in medication adherence.

The findings indicate that education level is not significantly associated with medication adherence among older adults with hypertension (p = 0,388). Respondents with formal education showed adherence levels similar to those of those who had never attended school. This suggests that, in rural settings, formal education is not the primary determinant of adherence behavior. Health-related behaviors in such communities are shaped more by social interaction, routine elderly health posts (*posyandu lansia*), and direct communication with health workers rather than academic capacity (Wulandari et al., 2021). This result aligns with Pratiwi et al., (2020) and Amalia et al., (2021), who found that repeated health education and family support compensate for limited formal schooling. Emphasized that education alone does

not affect adherence unless accompanied by adequate health literacy. Within the Health Belief Model (HBM), education does not directly determine adherence; instead, it influences perceptions of benefits and risks. (Pan et al., 2023).

Employment status also showed no significant association with medication adherence (p = 0,364). Both working and non-working respondents demonstrated similar adherence patterns. The availability of free antihypertensive medication through the National Health Insurance (JKN) reduces financial barriers and mitigates the influence of employment. This finding is consistent with Supriatna et al., (2022) and Octavia et al., (2025)Who reported that social and family support, rather than economic activity, determined adherence among rural communities. In some contexts, heavy workloads may even reduce adherence. (Alshammari et al., 2023). This underscores that employment is a contextual factor whose effects are moderated by family support and access to health services.

Family income was not significantly correlated with adherence (p = 0.082). Although most respondents had incomes below the regional minimum wage, low income did not reduce adherence levels. This may be explained by the fact that antihypertensive medications are provided free of charge through the JKN program, and patients can obtain routine services at Puskesmas Sesayap Hilir without incurring transportation costs, as the facility is within easy reach for most residents. As a result, financial constraints play a minimal role in limiting access to treatment. Similar findings were reported by Amelia et al. (2024) and Elnaem et al. (2021), showing that universal health coverage reduces the influence of income on health outcomes. In the PRECEDE–PROCEED model, income is categorized as an enabling factor; thus, when economic barriers are eliminated, reinforcing factors such as family support and motivation become more decisive (J. Kim et al., 2022). Strengthening these psychosocial elements, therefore, becomes more relevant than improving economic status.

The study shows no significant association between hypertension duration and adherence (p = 0.657; PR = 0.82; 95% CI: 0.33–2.01). Most respondents had lived with hypertension for more than three years, yet adherence remained low. This pattern may reflect *therapeutic fatigue*, characterized by boredom and declining motivation after long-term treatment (Lainsamputty, 2021). Long-standing patients may perceive their condition as stable and discontinue medication once symptoms diminish. Similar findings were reported by Pratiwi et al. (2020), Chan et al. (2021), and Pania et al. (2025), who found reduced adherence among those with longer disease duration. Yeni et al. (2016) highlighted that adherence in long-term patients improves only when strong family support is present. The Chronic Illness Adaptation Theory, as explained by Stuifbergen et al. (2008), states that emotional and

behavioral adaptation over time does not always favor adherence, especially in the absence of social support. Continuous education and structured follow-up, such as home visits and reminder systems, are essential to maintain adherence among long-term patients.

Knowledge of hypertension showed a strong and significant association with adherence ($p < 0,001$). Respondents with good knowledge were more likely to adhere to treatment. Knowledge enhances risk perception, understanding of complications, and the perceived benefits of consistent medication, in line with the Health Belief Model. Similar associations were reported by Pratama & Ariastuti, (2016), Ruhmiati et al., (2025), Burnier et al., (2020), Togatorop, (2024) , emphasizing knowledge as a key predictor of antihypertensive adherence. Knowledge also improves self-management abilities and self-efficacy, preventing misconceptions such as stopping medication when blood pressure normalizes. (Rifandani et al., 2023). Education delivered through interpersonal communication, health workers, *posyandu lansia*, and family members is more effective for low-literacy older adults than written media. As noted by Theofilou, (2022) Greater knowledge strengthens self-efficacy, thereby directly promoting adherence.

Family support demonstrated a strong association with adherence ($p < 0.001$; PR = 24.65; 95% CI: 5.83–104.14). Supported individuals were 24 times more likely to adhere than those without support. In this study, family support was primarily provided by spouses (husband or wife) and adult children, and, in some cases, by caregivers who lived with or regularly assisted the elderly. These family members offered emotional encouragement, medication reminders, help with obtaining or organizing medicines, and assistance during health visits—forms of instrumental support that are critical for older adults who may experience cognitive decline or physical limitations. This finding is consistent with studies by Nurannisa et al. (2022), Soesanto et al. (2021), and Uchmanowicz et al. (2018), which highlight family support as a key determinant of medication adherence. According to Pakpahan et al. (2024), family support encompasses emotional, instrumental, informational, and appraisal aspects, all of which are essential for chronic disease management. Family involvement strengthens adherence by providing external cues to action and enhancing self-efficacy. In rural settings, decision-making often relies more on family influence than medical advice (Sartika, 2024). Supriatna et al. (2022) also emphasized that active family engagement significantly improves adherence in rural communities.

Motivation showed a significant association with adherence ($p < 0,001$; PR = 21,93; 95% CI: 6,6–72,8). Highly motivated respondents were more likely to adhere consistently. Motivation is an internal driving force that encompasses both intrinsic and extrinsic

components. (Lindberg et al., 2019). Studies by (2017), Pratama & Ariastuti (2016), Mahgoub et al., and Utari et al. (2021) confirm that motivation is one of the strongest predictors of long-term adherence. Motivated older adults better understand the purpose of treatment, maintain long-term health goals, and are less likely to discontinue medication. Among older adults, motivation is often linked to family values and spirituality, such as the desire not to burden family members or to remain healthy for worship, strengthening the emotional basis for adherence.

Factor analysis extracted two main components, accounting for 64.45% of the total variance. Psychosocial Resources includes knowledge (0.844), family support (0.859), and motivation (0.884). These three variables form a strong psychosocial foundation that promotes adherence. Evidence from Febriana et al., (2025) and H. C. Kim et al., (2021) Supports the dominant role of psychosocial determinants. Within Social Cognitive Theory, knowledge, self-efficacy, and social support mutually reinforce one another, sustaining long-term adherence (Mahgoub et al., 2022). Strengthening these components through repeated education, family involvement, and community-based programs aligns with IDF, (2025) Recommendations for chronic disease management. Demographic and Disease are the second factor, which includes education (0.696), duration of hypertension (-0.704), and employment (0.799). Although not significant in bivariate analysis, these variables contribute indirectly to adherence. The negative loading for duration supports the *treatment fatigue* concept. (Kretchy et al., 2021). These factors act as predisposing influences but are weaker than psychosocial determinants. Psychosocial Resources emerge as the dominant factor influencing adherence. Knowledge strengthens perceived benefits, family support reinforces motivation, and motivation drives actual treatment behavior. Therefore, improving adherence should prioritize enhancing psychosocial components through personalized education, family-centered interventions, and community engagement. (Suleiman et al., 2024).

Strengthening medication adherence in this population, therefore, requires strategies that enhance health literacy, foster family involvement, and sustain patient motivation through ongoing counseling and community-based support. Interventions grounded in psychosocial empowerment are essential to ensure long-term adherence and effective hypertension management among older adults.

Conclusion

This study demonstrates that medication adherence among older adults with hypertension in the working area of Puskesmas Sesayap Hilir is primarily influenced by psychosocial rather than demographic factors. Education level, employment status, family

income, and duration of hypertension were not significantly associated with adherence. In contrast, knowledge, family support, and motivation showed strong and consistent relationships with adherence, indicating that psychosocial resources play a pivotal role in shaping treatment behaviors among older adults. Factor analysis further confirmed this pattern, identifying psychosocial resources as the dominant component explaining variability in adherence.

Based on these findings, several recommendations can be proposed for practical application. Primary care providers should strengthen health literacy interventions through regular counseling, structured education sessions, and simplified information materials tailored to older adults. Enhancing family involvement, particularly from spouses, adult children, and caregivers, should be integrated into routine hypertension management, such as through family-based counseling or reminder-support systems. In addition, programs aimed at maintaining or improving patient motivation, such as motivational interviewing, peer-support groups, and consistent follow-up contacts, may help sustain adherence over time. At the policy level, incorporating psychosocial screening into hypertension services can support early identification of patients at risk for non-adherence.

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