Analysis of Medication Adherence Level and Influencing Factors in Hypertension Patients in Samarinda City

Sinta R. Dewi[1,2], Almahdy[1*], Hardisman Dasman [3], Syofyan[1], Aldyba S. Hafifah[2]

[1]Faculty of Pharmacy, Andalas University, Campus Limau Manis, Pauh, Padang, West Sumatra
[2] Faculty of Pharmacy, Universitas Muhammadiyah Kalimantan Timur, Sidodadi, Samarinda Ulu, Kota Samarinda, East Kalimantan
[3]Faculty of Medicine, Andalas University, Campus Limau Manis, Pauh, Padang, West Sumatra

*Email correspondence : almahdya@phar.unand.ac.id

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Abstract

Hypertension is a degenerative condition that significantly contributes to global morbidity and mortality, making medication adherence a critical factor in achieving long-term therapeutic success. This study investigates the relationship between patient-related factors and adherence to antihypertensive medication. A cross-sectional analytical survey was conducted among 195 hypertensive patients in Samarinda, East Kalimantan. Data were collected using a structured questionnaire incorporating the MMAS-8 scale, which categorizes adherence into high (score = 8), moderate (score = 6–7), and low (score < 6), alongside a validated instrument assessing sociodemographic, clinical, and behavioral determinants. Statistical analysis employed chi-square tests and odds ratios (OR) with 95% confidence intervals. The majority of patients demonstrated low adherence (65.6%), followed by moderate (28.7%) and high adherence (5.6%). Significant associations were found between adherence levels and gender (P = 0.033, OR = 0.513, 95% CI: 0.276–0.951), knowledge level (P = 0.013, OR = 2.190, 95% CI: 1.176–4.079), duration of hypertension (P = 0.017, OR = 0.483, 95% CI: 0.265–0.881), and insurance status (P = 0.004, OR = 0.080, 95% CI: 0.009–0.680). Knowledge level emerged as the most influential factor in promoting adherence. These findings highlight the importance of targeted educational interventions and sustained support for patients at risk of poor adherence, aiming to optimize antihypertensive therapy and prevent long-term complications. The study advocates for strengthened evidence-based clinical practices and underscores the need for health policy reforms particularly in patient education and insurance accessibility to improve hypertension management in primary care settings.

Keyword: Adherence, Hypertension, Gender, Knowledge

INTRODUCTION

Hypertension is a chronic condition characterized by elevated blood pressure resulting from increased cardiac workload, as the heart pumps blood throughout the body to meet its oxygen and nutrient demands (Unger et al., 2020). According to the World Health Organization (2024), the global prevalence of hypertension is expected to rise in parallel with population growth, with projections indicating that by 2025, approximately 29% of the world's population will be affected. In Indonesia, the prevalence of hypertension was reported at 34.1% in 2023(Kementerian Kesehatan Republik Indonesia, 2022).

East Kalimantan is one of the Indonesian provinces with a high prevalence of hypertension. According to disease incidence data from 2023, 63.32% of reported cases in the

region were hypertension-related, with 21.51% of the province's population residing in Samarinda (Dinas Kesehatan Kalimantan Timur, 2023). Although access to healthcare services in Samarinda is relatively high, this does not necessarily translate into consistent treatment adherence among patients. Non-adherence can result in deteriorating health status and serious complications associated with impaired organ perfusion, including symptomatic hypotension, syncope, and acute kidney injury (Kim et al., 2025).

According to the Indonesian Health Survey (SKI) (2023), 37.1% of patients did not adhere to their prescribed medication regimen. Among them, 19.3% cited boredom or forgetfulness as the primary reason for non-adherence, while 7.9% preferred traditional medicine over antihypertensive medication (Badan Kebijakan Pembangunan Kesehatan, 2023). Unintentional non-adherence refers to unplanned behavior resulting from factors beyond the patient's control, whereas intentional non-adherence occurs when patients deliberately choose not to take their medication (Gumilas, Harini, Samodro, & Ernawati, 2021). Multiple factors contribute to medication non-adherence, including knowledge levels, geographic and social contexts, pharmacy services, disease conditions, and economic circumstances (Paczkowska et al., 2021). In addition, psychosocial factors such as disease severity, self-perceived health, reported symptoms, and self-efficacy also influence treatment adherence (Al-Noumani, Al-Harrasi, Jose, Al-Naamani, & Panchatcharam, 2022).

Although several national surveys have assessed medication adherence in Indonesia, localized studies examining specific sociodemographic and health system factors influencing antihypertensive adherence remain limited, particularly in resource-constrained urban settings such as Samarinda. Few studies have systematically investigated adherence determinants in East Kalimantan using validated instruments like the Modified Morisky Adherence Scale 8 (MMAS-8). Therefore, this study aims to identify the factors associated with treatment adherence among patients with hypertension in Samarinda, and to analyze the relationship between these factors and medication adherence using the MMAS-8 framework.

METHODS

This study employed a descriptive cross-sectional survey design to evaluate the relationship between patient characteristics and adherence to antihypertensive medication at a single point in time. This approach was selected for its efficiency in concurrently identifying adherence-related factors and its alignment with the descriptive objectives of the study. It also serves as a foundational framework for future longitudinal research, which may offer deeper insights into evolving adherence patterns.

The study was conducted from 5 July to 12 August 2023 at a hospital in Samarinda and received ethical approval from the Ethics Committee of Abdoel Wahab Sjahranie General Hospital (Approval No. 222/KEPK-AWS/IX/2023). Participants were recruited through convenience sampling and included hypertensive patients aged ≥18 years who had been taking antihypertensive medication for several months, were diagnosed with essential hypertension (≥140/90 mmHg), and consented to participate. Individuals with cognitive impairment, severe medical conditions, or pregnancy were excluded.

This study employed face-to-face interviews using a structured questionnaire administered in Indonesian. The questionnaire was divided into two main sections. Part A collected demographic and clinical information, including gender, educational level, employment status, duration of illness, insurance coverage, blood pressure control, knowledge level, access to health services, and the role of health workers. Part B comprised four thematic categories: patient knowledge level, access to health services, role of health workers, and the MMAS-8 adherence scale.

The survey required approximately 15–25 minutes to complete. Validity testing was conducted on all non-MMAS instruments, including the knowledge and health service access questionnaires. Results indicated that all items in the knowledge questionnaire were significantly correlated with the total score ($p < 0.005$), with a correlation coefficient of $r = 0.755$, demonstrating strong validity. The health service access questionnaire yielded a correlation coefficient of $r = 0.621$, which is also considered valid and acceptable. Pearson correlation analysis was used to assess the relationship between individual items and total scores.

The MMAS-8 questionnaire was used to assess patients' adherence to antihypertensive medication. This validated instrument comprises eight items: seven with yes/no response options and one using a five-point Likert scale. Adherence scores are categorized as follows: a score <6 indicates low adherence, 6–7 indicates moderate adherence, and a score of 8 indicates high adherence(Morisky, Ang, Krousel-Wood, & Ward, 2023). Use of the MMAS-8 questionnaire in this study was officially licensed under certificate number 9361-1597-3245-9311-8637.

Data were analyzed using SPSS version 23 (IBM Corporation, New York, USA), selected for its user-friendly interface, comprehensive statistical capabilities, and established reliability in clinical data analysis, including non-parametric procedures. Descriptive statistics were presented as frequency tables, mean values, and standard deviations for continuous variables, and percentages for categorical variables. The Chi-square test was employed to examine the

association between patient characteristics and adherence levels, which served as the dependent variable. Odds ratios (OR) with 95% confidence intervals were also calculated to provide additional insight into factors influencing adherence. A p-value < 0.05 was considered statistically significant, ensuring the robustness and interpretability of the findings.

RESULTS

Table 1. Characteristics of Hypertensive Patients

Variables	Group	Frequency (n)	Percentage (%)
Age (Years)	18 – 25	4	2.1
	26 – 45	26	13.3
	46 – 65	126	64.6
	> 65	39	20
Gender	Male	65	33.3
	Female	130	66.7
Education Level	Lower Secondary Education	78	40
	Associate's Degree	117	60
Occupational status	Employed	80	41
	Unemployed and retired	115	59
Duration of hypertension	<5 years	7	3.6
	>5 years	188	96.4
Participant insurance	Have	149	76.4
	None	46	23.6

The majority of respondents were female (66.7%), aged 46–65 years (64.6%), with most being unemployed or retired (59.0%), and had been living with hypertension for more than five years (96.4%). Most respondents held an associate's degree as their highest level of education. These demographic and clinical characteristics provide important context for interpreting patients' adherence to antihypertensive treatment.

Table 2. Distribution of the Modified Morisky Adherence Scale 8

Questions	Yes	No
1) Do you sometimes forget to take your antihypertensive medication?	64,1%	35,9%
2) People occasionally miss taking their medication for reasons other than forgetting. Over the past two weeks, were there any days when you did not take your antihypertensive medication?	35,4%	64,6%
3) Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when taking it?	24,6%	75,4%
4) When you travel or leave home, do you sometimes forget to bring your antihypertensive medication with you?	46,2%	53,8%
5) Did you take your antihypertensive medication yesterday?	90,3%	9,7%
6) When you feel that your blood pressure is under control, do you sometimes stop taking your medication?	60,5%	39,5%
7) Taking medication every day can be inconvenient for some people. Do you ever feel hassled about sticking to your hypertension treatment plan?	33,8%	66,2%
8) How often do you have difficulty remembering to take all your medications?		
Never	45,1%	0
Occasionally	19,5%	0
Sometimes	24,1%	0
Often	3,6%	0
All the time	7.7%	0

Table 2. presents patient responses based on the MMAS-8 questionnaire. The majority of participants reported occasionally forgetting to take their medication (64.1%) or discontinuing treatment when symptoms improved (60.5%). Additionally, 24.6% had stopped treatment without consulting a physician. However, 90.3% confirmed that they had taken their medication the previous day. Notably, 60.5% reported stopping medication when asymptomatic, and 24.1% experienced difficulty remembering to take their prescribed medication. These findings suggest that adherence behavior is significantly influenced by patients' perceptions of their clinical condition.

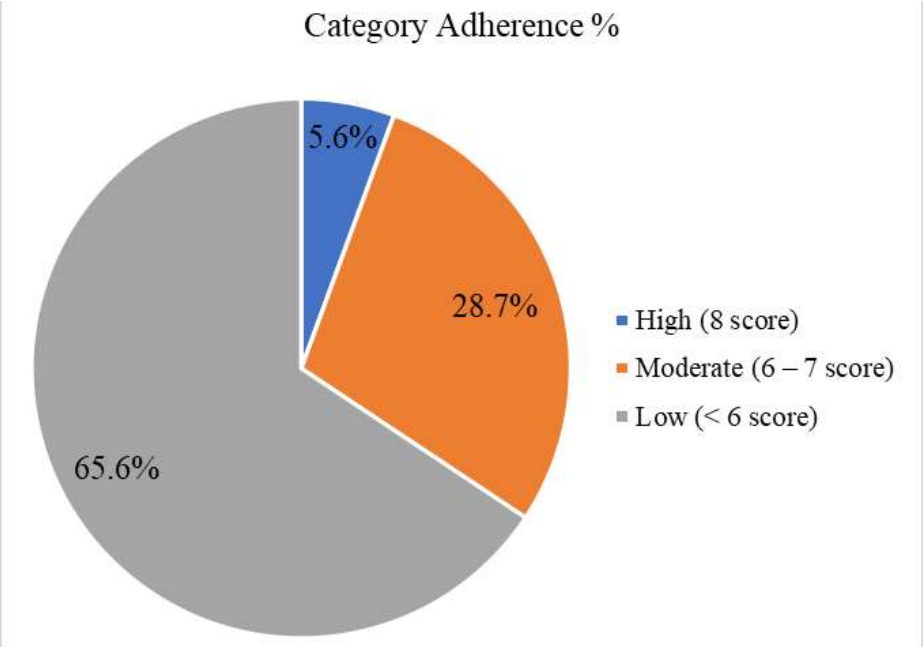

Figure 1 . Distribution of Medication Adherence Levels Among Individuals with Hypertension

Most patients (65.6%) were categorized as having low adherence, while 28.7% exhibited moderate adherence, and only 5.6% demonstrated high adherence. The MMAS-8 is a standardized assessment tool comprising eight items designed to evaluate patient adherence to pharmacological therapy. The first seven items use yes/no response options, with each 'yes' answer indicating non-adherence scored as 1, and each 'no' answer scored as 0. The eighth item employs a five-point Likert scale, with responses converted to a score ranging from 0 to 1 based on the frequency of the behavior. The total MMAS-8 score ranges from 0 to 8, interpreted as follows: scores <6 indicate low adherence, scores from 6 to <8 indicate moderate adherence, and a score of 8 indicates high adherence. Adherence levels were analyzed using a 2×3 chi-square test to examine their association with other variables.

Table 3. Distribution of Adherence in Different Groups

Variables	Group	Low Adherence	Moderate Adherence	High Adherence	Total
Gender	Male	55,4%	38,5%	6,2%	33,3%
	Female	70,8%	23,8%	5,4%	66,7%
Education Level	Lower Secondary Education	68%	27%	5%	40%
	Associate's Degree	64.1%	29,9%	6%	60%
Occupational status	Employed	61,7%	33,3%	5%	30,8%
	Unemployed and retired	67,4%	26,7%	7,6%	69,2%
Duration of hypertension	<5 years	56,1%	40,2%	3,7%	42,1%
	>5 years	72,6%	20,4%	7,1%	57,9%
Participant insurance	Have	67,9%	27,1%	5,3%	96,4%
	None	14,3%	71,4%	14,3%	23,6%
Blood pressure at control	< 140/90mmHg	58,7%	32,6%	8,7%	23,6%
	> 140/90mmHg	67,8%	27,5%	4,7%	76,4%
Knowledge	Low	75,3%	21,2%	3,5%	43,6%
	High	58,2%	34,5%	7,3%	56,4%
Access service	Less	66,1%	28,6%	5,4%	57,4%
	Good	65,1%	28,9%	6%	42,6%
The role of health workers	Low	63,6%	24,2%	12,1%	16,9%
	High	66,0%	29,6%	4,3%	83,1%

Table 3. shows that 70.8% of female participants exhibited low adherence, while 68.0% of individuals with lower secondary educational attainment (i.e., primary, junior, and high school levels) also demonstrated low adherence. Additionally, 67.4% of unemployed or retired individuals and 72.6% of patients with a five-year history of hypertension reported low adherence. Furthermore, 75.3% of participants with limited knowledge about hypertension showed low adherence, highlighting the influence of patient knowledge on treatment behavior.

Table 4. Correlations between Influencing Factors and Medication Adherence

Variables	Adherent		
	p-Value (Chi-Square)	*Odds Ratio*	95% CI
Gender	0,033*	0,513	0,276 – 0,951
Education	0,580	1,187	0,647 – 2,179
Occupational status	0,436	1,286	0,683 – 2,421
Duration of hypertension	0,017*	0,483	0,265 – 0,881
Participant insurance	0,004*	0,080	0,009 – 0,680
Blood pressure at control	0,256	0,675	0,342 – 1,333
Knowledge	0,013*	2,190	1,176 – 4,079
Access service	0,883	1,046	0,576 – 1,900
The role of health workers	0,790	0,900	0,412 – 1,963

Table 4. shows that gender (p = 0.033; OR = 0.513; 95% CI: 0.276–0.951), duration of hypertension (p = 0.017; OR = 0.483; 95% CI: 0.265–0.881), insurance coverage (p = 0.004; OR = 0.080; 95% CI: 0.009–0.680), and knowledge level (p = 0.013; OR = 2.190; 95% CI: 1.176–4.079) are significantly associated with patient adherence. Female patients, those with a hypertension duration exceeding five years, and individuals without insurance were more likely

to exhibit low adherence. In contrast, patients with higher levels of knowledge were twice as likely to adhere to their prescribed therapy.

These findings underscore the importance of patient education, financial support, and sustained disease management in improving treatment adherence. Knowledge, insurance status, gender, and duration of hypertension emerged as the primary factors influencing medication adherence among hypertensive patients in Samarinda. Targeted interventions addressing these modifiable variables are essential for enhancing adherence and reducing the risk of hypertension-related complications

DISCUSSION

Inadequate adherence to antihypertensive treatment can lead to poor blood pressure control, increased comorbidities, and higher hospitalization rates (Husnawati, Sukandar, & Anggadiredja, 2022). The Health Belief Model (HBM) emphasizes that individuals' perceptions of vulnerability, severity, benefits, and barriers significantly influence medication adherence behavior (Nili, Mohamed, & Kelly, 2020). Similarly, Social Cognitive Theory and Self-Regulation Theory underscore the role of knowledge, treatment beliefs, and self-efficacy in shaping health-related behaviors, including medication adherence. Recent systematic reviews confirm that interventions grounded in behavioral theories, such as the Self-Regulation Model, Social Cognitive Theory, and the Theory of Planned Behavior, effectively enhance adherence in chronic disease management (Hamtaeigashti, Shamsi, Sahraian, Soltani, & Almasi-Hashiani, 2023).

This study contributes to the growing body of literature on antihypertensive adherence in Indonesian urban populations by employing the MMAS-8 tool. It highlights the interaction between sociodemographic and systemic factors, such as insurance status and access to care, and behavioral adherence frameworks. Mahmood, Jalal, Hadi, Orooj, & Shah (2020) reported that 62.3% of hypertensive patients assessed via MMAS-8 were adherent, exceeding the non-adherent rate of 37.7%. Their findings also suggest that the likelihood of developing hypertension and related complications increases with age, particularly among individuals over 40 years. Oktamianti, Kusuma, Amir, Tjandrarini, & Paramita (2022) found that the highest prevalence of hypertension occurred in 63.2% of individuals aged 60 years and above.

Our study further reveals that female patients exhibit higher adherence than male respondents (Tables 3 and 4). These results align with findings by Joho (2021) and Joo et al., (2023) who observed greater compliance among women. This trend may be attributed to women's stronger responsiveness to communication-based interventions and heightened

awareness and sensitivity toward health-related issues (Venditti, Bleve, Morano, & Filardi, 2023).

Educational level is often considered a determinant of patient adherence, as it can influence lifestyle patterns, nutritional choices, and socioeconomic status. Higher education is generally associated with greater health awareness (Świątoniowska-Lonc, Polański, Mazur, & Jankowska-Polańska, 2021). However, the findings of this study diverge from that assumption, indicating no significant relationship between education level and medication adherence. This aligns with research by Konlan et al., (2023), which suggests that patients with lower educational attainment may exhibit strong trust in healthcare providers, thereby enhancing their adherence to treatment.

This study found that most hypertensive patients were retired. Compared to working individuals, retired patients tend to engage in less physical activity and exercise, which may contribute to poorer cardiovascular outcomes. According to this study, individuals with lower activity levels have a 30–50% higher likelihood of developing hypertension compared to those who are more physically active.

The duration of hypertension was found to significantly influence treatment adherence. Patients who had lived with hypertension for more than five years demonstrated higher levels of medication adherence. This finding aligns with research by Cahyadi et al., (2024) and Kishor et al., (2024), both of whom reported that longer disease duration is associated with greater compliance and increased familiarity with treatment protocols. Extended exposure to the condition may enhance patients' understanding of the benefits of consistent therapy. However, this result contrasts with the findings of Gemeda et al., (2020), who reported no significant relationship between disease duration and adherence. Their study suggested that prolonged illness may lead to treatment fatigue or boredom, ultimately reducing adherence over time.

Insurance participation among hypertensive patients was found to have a significant relationship with treatment adherence. In Indonesia, the national health insurance system, Badan Penyelenggara Jaminan Sosial (BPJS), covers the cost of essential treatment and care at first-level health facilities, thereby reducing financial barriers to consistent therapy (Yusransyah, Halimah, & Suwantika, 2020). This finding aligns with a study by Zhou, Zhang, Gu, Cai, & Feng (2024) which identified a positive correlation between drug financing and adherence among hypertensive patients. Individuals with access to free treatment demonstrated higher levels of compliance than those without such access, as prolonged therapy often entails increasing financial burden.

This study also found that controlled blood pressure did not significantly influence patient adherence. While blood pressure control is generally considered a key indicator of treatment effectiveness and patient compliance, the present findings suggest that it may not directly motivate adherence. Nevertheless,. Choudhry et al., (2021) reported that patients with controlled hypertension tend to exhibit higher levels of compliance compared to those with uncontrolled blood pressure.

This study also found a significant correlation between patients' knowledge levels and treatment adherence. Knowledge is recognized as a key factor influencing adherence (Table 5), with patients possessing higher levels of knowledge being 2.19 times more likely to adhere to treatment than those with lower knowledge. This finding aligns with the study by Das, Neupane, Singh Gill, & Bir Singh, (2021), which reported that hypertensive patients with greater knowledge were significantly more adherent to therapy ($p < 0.005$). These results suggest that the better a patient understands the nature of hypertension and the therapy involved, the higher their likelihood of compliance. Accordingly, enhancing patient education through targeted communication from health professionals is essential for improving adherence among hypertensive individuals.

Based on the research findings, patients with access to quality health services (Table 4) demonstrated higher levels of treatment adherence. These results are consistent with the study byRhamttallah, Mahmoud, Mohamedelnour, Magzoub, & Altayib (2025), which found that easy access to community health centers significantly increases patient compliance. When healthcare services are readily accessible, patients are more likely to attend consultations and consistently receive treatment or medication.

Similarly, the study by ALruwaili (2024) reported that patients who receive better healthcare tend to be more compliant with their prescribed therapy. In response, some healthcare centers have implemented strategies to enhance treatment adherence, such as offering low-cost medical care for patients with financial constraints and providing home care services for those unable to visit healthcare facilities. Moreover, patients with access to blood pressure monitors, nutritious food at home, and opportunities for physical activity tend to adopt healthier behaviors and show greater adherence to treatment. Conversely, limited access to these resources can hinder adherence to non-pharmacological interventions outside the clinical setting (Zhou et al., 2024).

In this study, the role of healthcare workers did not show a statistically significant influence on adherence levels among hypertensive patients. Nonetheless, healthcare professionals, including pharmacists, can play a critical role in promoting adherence by

providing comprehensive education and fostering accurate, positive attitudes toward hypertension management. Pharmacists also monitor pharmacotherapy to ensure alignment with patients' clinical conditions, assess potential drug interactions, and educate both patients and their families on the importance of consistent medication use.

These observations align with findings fromMentari, Dwidaningrum, Rizki, & Mentari (2024) whose study at a healthcare facility in West Java demonstrated that healthcare workers contribute meaningfully to improving treatment adherence. Pharmacist-led interventions enhance patient safety and therapeutic effectiveness, and may reduce complications associated with non-adherence, making their involvement essential in supporting adherence to prescribed treatment plans.

The findings underscore the need for structured adherence education programs, integration of digital health tools, and policy reforms to ensure equitable access to antihypertensive care. Future research should explore longitudinal interventions and assess causal pathways through cohort or experimental designs to deepen our understanding of adherence dynamics in hypertensive populations.

CONCLUSIONS

Adherence to antihypertensive treatment was significantly influenced by gender, knowledge level, duration of hypertension, and insurance ownership, with knowledge emerging as the most dominant factor. These findings underscore the critical role of health education and equitable access to healthcare services in improving patient adherence. They also support the integration of health promotion and chronic disease monitoring programs within Indonesia's BPJS policy framework.

However, this study has several limitations, including a relatively short data collection period and the potential for information bias, as some respondents may have provided socially desirable responses or hesitated when completing the questionnaire. To address these limitations, future research should adopt a longitudinal design and employ more comprehensive data collection methods to better evaluate the effectiveness of implemented intervention strategies.

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