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Health Literacy and Medication Adherence Among Elderly Hypertensive Patients in Indonesian Primary Healthcare: A Cross-Sectional Study

Irma Susanti[1,2], Yunita Nita[3], Abdul Rahem[4*], Riza Alfian[5]
[1]Doctoral Program in Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Surabaya 60115, East Java, Indonesia
[2]Department of Clinical and Community Pharmacy, Bachelor of Pharmacy Program Faculty of Health Science, Universitas Muhammadiyah Lamongan, Lamongan 62218, East Java, Indonesia
[3]Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya 60115, East Java, Indonesia
[4]Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya 60115, East Java, Indonesia
[5]Department of Pharmacy, Sekolah Tinggi Ilmu Kesehatan ISFI Banjarmasin, Banjarmasin 70123, South Kalimantan, Indonesia

***Corresponding Author**: E-mail: abdulrahem@ff.unair.ac.id

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ABSTRACT

Introduction: Health literacy plays a pivotal role in chronic disease care, including hypertension, by influencing patients' ability to understand health information and maintain long-term treatment adherence. However, evidence regarding its correlation with medication adherence among elderly populations remains limited, especially in developing countries with diverse socioeconomic and educational backgrounds. Accordingly, this investigation aimed to examine the association between health literacy and adherence to medication among older adults with hypertension residing in East Java, Indonesia.

Methods: The study employed a cross-sectional design and was implemented from February to June 2024 at the 2 Primary Healthcare Centers in Lamongan, East Java province, Indonesia. Participants were eligible if they were diagnosed with hypertension, were at least 60 years of age, and had received antihypertensive treatment for no less than three months. The pill count method was used to evaluate medication adherence, with adherence defined as a score >80%. Participants' health literacy levels were measured using the Indonesian version of the validated HLS-EU-SQ10 instrument., and the results were classified into four categories: inadequate, problematic, sufficient, and excellent. The relationship between variables was evaluated using Spearman's rank correlation analysis.

Results: A total of 212 patients were enrolled, the participants were predominantly female (75%), aged between 60–69 years (80%), and had low education. Most patients were prescribed amlodipine as monotherapy or in combination with other drugs. Health literacy levels were predominantly problematic (42.9%) and inadequate (40.1%). Meanwhile, 78.8% of the patients exhibited good adherence to medication. A weak positive correlation identified between health literacy and medication adherence ($r=0.210$, $p=0.002$).

Conclusion: These findings suggest a significant weak correlation between health literacy and adherence to medication among elderly with hypertension. Health literacy may therefore be considered an important factor in hypertension management to support optimal therapeutic outcomes in elderly populations.

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INTRODUCTION

Health literacy is increasingly recognized as a critical factor that influences individuals' ability to make informed health decisions and achieve better health outcomes, particularly among individuals living with chronic diseases. The concept encompasses cognitive and social competencies that enable individuals to access, understand, critically appraise, and apply health information when making healthcare-related decisions (1). An individual's level of health literacy can be demonstrated through their capacity to obtain, assess, and comprehend essential health information and services required to make suitable decisions related to their health. (2). Recent literature describes health literacy as a multidimensional concept that includes functional, communicative, and critical components, as initially introduced by Don Nutbeam and widely adopted in contemporary empirical and systematic review research (3). These domains represent progressively advanced skills, ranging from basic comprehension of health information to active engagement and critical decision-making in healthcare contexts. Within chronic disease management, health literacy is considered a modifiable determinant that may influence patient behaviors through several mechanisms, including improved understanding of treatment regimens, enhanced patient–provider communication, and increased self-management capacity (1,4).

Although previous studies have explored various factors associated with medication adherence, the relationship between health literacy and adherence to medication remains insufficiently examined in specific study subjects. Existing literature is often limited by heterogeneous study populations, a predominant focus on general adult populations, and insufficient application of multidimensional health literacy frameworks, thereby reducing the applicability of the findings to elderly populations (6). In addition, previous studies have reported variability in study characteristics and inadequate representation of older adults, highlighting the need for more population-specific research (5,6).

Medication adherence represents a fundamental aspect of hypertension care, and can be defined as the degree to which patients comply with recommended treatment plans, including pharmacological therapy and lifestyle modifications. However, adherence remains suboptimal worldwide, particularly among elderly populations, where issues including reduced cognitive capacity, polypharmacy, and difficulties in accessing health information may impede optimal adherence to treatment regimens (4,7). Health literacy may facilitate significantly in supporting adherence by enhancing patients' comprehension of treatment instructions, engage in shared decision-making, and manage complex therapeutic regimens (1,4). Asystematic review and meta analysis involving 25 studies with 12.628 participants from 15 different countries across the Americas, Europe, Asia, and Africa, revealed that 45.2% of patients did not adhere to their treatment plan ($p<0.001$) (8). Moreover, evidence from primary healthcare settings in low-middle income countries, particularly Indonesia, remains limited, despite the essential function of primary care in longterm disease care. A study conducted at Padang Pasir Primary Healthcare Center, Indonesia found that most respondents were categorized as having problematic health literacy (39.7%). These findings emphasize the necessity for comprehensive and targeted interventions aimed at improving health literacy among individuals with hypertension (9). A study conducted in Wangurer Village, North Minahasa, Indonesia, found that 43.7% of the elderly people surveyed did not adhere to their prescribed treatment plans (10).

Therefore, further population-specific investigations are needed to obtain a more comprehensive understanding of the correlation between health literacy and adherence to medication among elderly diagnosed with hypertension in primary healthcare settings. To address this knowledge gap, this study sought to assess the correlation between health literacy and adherence to medication in elderly with hypertension receiving care at primary healthcare facilities in Indonesia.

METHOD

Study Design

A cross sectional approach was implemented in this research, and the data collection process was conducted between February and June 2024.

Study Population and Sampling

A purposive sampling technique was used. Eligible participants were identified from the hypertension patient registries at Babat and Lamongan Primary Healthcare Centers. Patients who met the inclution criteria were approached consecutively during their routine visits and invited to join the research. The eligibility requirements for

participant included the following conditions: (1) aged ≥60 years, (2) having a confirmed diagnosis of hypertension, and (3) taking antihypertensive medication for at least three months. Participants were excluded if they had severe cognitive impairment, communication limitations and inability to complete the questionnaire. All eligible individuals throughout the recruitment period were invited to take part in the research.

The sample size was calculated to detect a moderate correlation (r = 0.3) with a significance level of 0.05 and 80% power. To enhance precision and account for the finite population, the sample size was further expanded using a population-based estimation method, resulting in a total of 212 participants.

Study Setting

This research was undertaken in 2 primary healthcare centers in Lamongan, East Java Province, Indonesia

Data Collection and Instruments

Medication adherence was evaluated using the pill count method. Patients were classified as adherent when the adherence rate was greater than 80%. Adherence was calculated by deducting the remaining tablets from the number of tablets originally provided, dividing the result by the prescribed daily dosage and adjusted according to the interval separating two consecutive visits, with the final result expressed as a percentage (11). The observation interval was defined as the time between two consecutive patient visits. For patients receiving multiple medications (polypharmacy), Medication adherence was determined according to the total number of prescribed antihypertensive agents. To enhance measurement accuracy, the research team verified by cross-checking patient-reported medication use with the remaining pill count and prescription records collected and documented by the research team at the Primary healthcare centers.

Health literacy was evaluated using the Indonesian validated version of the European Health Literacy Survey Questionnaire (HLS-EU-SQ10-IDN), which was developed to measure health literacy related to chronic disease management and the questionnaire demonstrated acceptable validity and reliability, with good internal consistency (Cronbach's alpha ≥ 0.7), supporting its use for assessing health literacy in the Indonesian population. The instrument consists of ten question, each rated from one (very difficult) to four (very easy). The health literacy index was determined by calculating, multiplying by 50, and then dividing by 3 yielded the health literacy index. The scores were categorized into four levels: inadequate (0–25), problematic (>25–33), sufficient (>33–42), and excellent (>42–50) (2).

Data collection was conducted using self-administered questionnaires. For participants who experienced difficulty reading or understanding the questions, trained research assistants provided assistance to ensure accurate responses. Medication adherence data were obtained using structured observation sheets.

Data Analysis

Bivariate analysis of the relationship between health literacy and medication adherence was performed using Spearman's rank correlation test on the quantitative data obtained. The analysis was conducted as an exploratory assessment, and the findings were interpreted as correlational rather than causal, as no multivariable analysis was conducted, potential confounding factors were not controlled; therefore, the observed correlation should be interpreted with caution and considered exploratory.

Ethical Approval

The study protocol was reviewed and approved by the Ethics Committee of the Faculty of Nursing, Universitas Airlangga (No. 3092-KEPK) in February 2024.

RESULTS

In this study, data were collected from 212 patients who met the inclusion criteria. The baseline characteristics of the participants are presented in Table 1. The majority of participants were female 75% (n=159), age 60-69 years 80% (n=169), and had low educational attainment (elementary or below, 53.3%). Most participants were housewives of 59.4% (n=126) reflecting the predominance of women in the sample. The predominant comorbidity identified was diabetes mellitus 45.75% (n=97), followed by dyslipidemia 7.55% (n=16).

Table 1. Sociodemographic of the Participants

No	Demographic Characteristics	Classification	n (%)
1	Gender	Male	53 (25)
		Female	159 (75)
2	Age (Year)	60-69	169 (80)
		70-79	39 (18)
		≥80	4 (2)
3	Education level	No formal education	5 (2.36)
		Primary education (grade 1-9)	16 (76,41)
		Secondary education (grade 10-12)	32 (15.09)
		Higher education (diploma or higher)	13 (6.13)
4	Occupation	Housewife	126 (59.4)
		Merchant	3 (1.4)
		Farmer	17 (8.0)
		Driver	1 (0.5)
		Self-employment	29 (13.7)
		Teacher	1 (0.5)
		Employee	1 (0.5)
		Not working	34 (16.0)
5	Comorbidity	DM	97 (45.75)
		Dyslipidemia	16 (7.55)
		Asthma	2 (0.94)
		Anemia	1 (0.47)
		GERD	1 (0.47)
		HHD	1 (0.47)
		CHF and Myalgia	1 (0.47)
		Dyslipidemia and DM	7 (3.30)
		CHD dan DM	2 (0.94)
		Dyslipidemia dan GERD	1 (0.47)
		Dyslipidemia and TBC	1 (0.47)
		No comorbidities	82 (38.68)

Notes: DM: Diabetes Mellitus; HHD: Hypertensive Heart Disease; CHF: Congestive Heart Failure; CHD: Coronary Heart Disease; TBC: Tuberculosis

The distribution of antihypertensive drug use is presented in table 2. The most frequently prescribed antihypertensive medication by patients was amlodipine 5 mg. Some patients received monotherapy, while others received combination therapy involving more than one antihypertensive drug. Only antihypertensive medications are presented, as many patients also received treatment for other medical conditions, including medication for comorbidities or mild symptoms.

Table 2. Distribution of Antihypertensive Drug Use Among Elderly Hypertensive Patients

No	Antihypertensive Agent	Dosage Strength (mg)	n*
1	Amlodipine	5	106
2		10	94
3	Bisoprolol	2,5	5
4		5	7
5	Candesartan	8	44
6		16	2
7	Captopril	25	3
8	Furosemide	20	4
9	Lisinopril	5	3
10		10	5
11	Nifedipine	5	2
12		30	1

No	Antihypertensive Agent	Dosage Strength (mg)	n*
13	Spironolactone	25	4

*Some patients receive more than one drugs

The distribution of health literacy levels among the study participants is presented in Figure 1. Most patients were classified as having inadequate health literacy 40.09% (n=85), problematic health literacy 42.92% (n=91) and 1.89% (n=4) of patients were classified as having excellent health literacy.

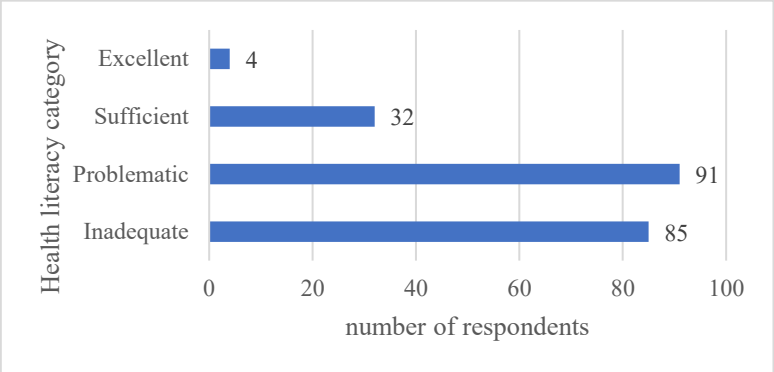

Figure 1. Levels of Health Literacy Among Elderly Patients with Hypertension

Medication adherence levels are shown in figure 2. The majority of patients were adherent to their medication (78.77%, n = 167), while 21.23% (n = 45) were classified as non-adherent.

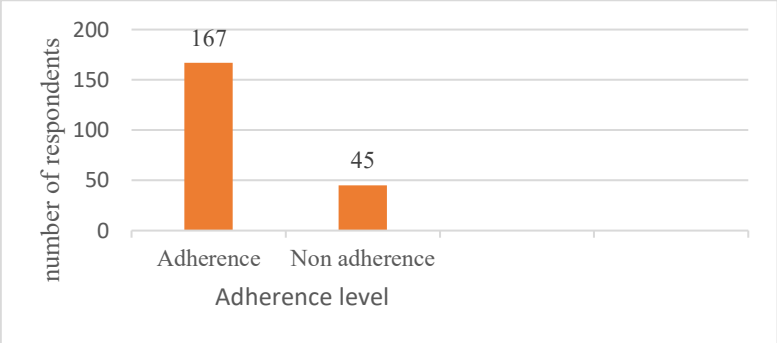

Figure 2. Medication Adherence

Table 3. Spearman's Rank Correlation Analysis

Variable	n	p	r
Health Literacy	212	0.002	0.210
Medication Adherence	212		

Among health literacy and adherence to medication was examined using Spearman's rank correlation test, as presented in table 3. The analysis revealed a statistically significant, weak positive correlation between health literacy and medication adherence (r=0.210, p=0.002). Confidence intervals were not reported because a non-parametric statistical method was used.

DISCUSSION

Most participants were classified as having inadequate or problematic health literacy (82.92%), this reflects ongoing vulnerability among older adults with lower levels of education. This finding is consistent with recent evidence indicating that health literacy tends to decline in elderly populations due to age-related cognitive limitations and structural barriers to accessing and processing health information (12–16). Low health literacy is known to

negatively influence medication adherence and self-management behaviors, particularly in chronic conditions such as hypertension. An adequate level of knowledge regarding the disease and its treatment is important for maintaining adherence to antihypertensive medication. Previous studies have consistently shown that individuals with low health literacy tend to exhibit suboptimal medication self-management behaviors (17). Chronic illnesses, such as hypertension, are often associated with lower health literacy, as patients may struggle to interpret and apply health-related information (18)(19). Self-management behaviors, including adherence to a healthy lifestyle and regular blood pressure monitoring, are positively associated with health literacy. Individuals with higher levels of health literacy tend to practice more effective self-care, which is crucial for controlling hypertension and reducing the risk of complications (20)(21).

The proportion of patients categorized as non-adherence was 21.23%, as shown in figure 2. Changes in hypertension patients' behavior regarding medication adherence influenced by education, health literacy, and social support were the results of a Shanghai study that modeled medication adherence for hypertensive patients (22). Adherence is essential for effective hypertension treatment. Poor medication adherence in hypertension is associated with serious long-term complications affecting the cardiovascular, renal, and neurological systems (23)(24). Evidence from a systematic review indicates that non-adherent patients have up to a 2–3-fold higher risk of cardiovascular events and a 1.5–2fold increased risk of hospitalization, along with 20–50% higher healthcare costs and reduced quality of life (25).

This study found a statistically significant but weak correlation between health literacy and medication to adherence (table 3). The relatively weak strength of the correlation suggests that health literacy alone may not sufficiently explain variations in medication adherence among elderly patients with hypertension. This finding is plausible, given that adherence behavior is multifactorial. In older adults, factors such as cognitive decline, polypharmacy, forgetfulness, and complex treatment regimens may reduce adherence independently of health literacy (26)(27)(28). In addition, behavioral factors, including patient beliefs, motivation, and perceived necessity of treatment, may weaken the direct relationship between knowledge-related capacity and actual medication-taking behavior (29)(30). Furthermore, several potential confounding factors were not included in the analysis, including cognitive function, socioeconomic status, comorbidities, duration of hypertension, treatment complexity, and social support. These factors may have influenced the observed relationship and contributed to the weak correlation.

Medication adherence among hypertensive patients may be improved by increasing their level of health literacy. A study from Turky show that health literacy significantly predicted medication adherence ($\beta = 0.545$, $p < 0.05$), indicating a moderate-to-strong positive association between health literacy and adherence behavior (31). Another study conducted in Korea reported that health literacy had a significant positive impact on medication adherence among older adults with chronic diseases. Health literacy was a strong predictor of adherence ($\beta = 0.43$, $p < 0.001$) (32). In elderly populations, health literacy serves as an important predictor of medication adherence. However, other factors, such as cognitive function, are also important predictors of medication adherence among elderly (6). Individual with limited health literacy often fail to adhere due to a lack of understanding of the given instructions, while those with higher health literacy may be non-adhere due to deliberate decision to ignore recommendations (33). Effective strategies to enhance health literacy include tailored educational programs, face-to-face or digital health education sessions, and the use of written and digital educational materials. These interventions can empower patients, improve disease related knowledge, and promote better self-management (4). Overall, although health literacy remains an important determinant, the weak correlation observed in this study highlights the need for a more comprehensive approach that addresses both cognitive and non-cognitive factors influencing medication adherence among elderly patients.

Interpretation of Key Findings

This study demonstrates that the majority of respondents were elderly women with low educational attainment, a profile that may limit their capacity to navigate and understand health information. Elderly have difficulties in understanding health information and engaging with healthcare providers (34), which may impact their ability to make informed health decisions (35). Diabetes mellitus was the most prevalent comorbidity, reflecting the high cardiometabolic burden often accompanying hypertension (36). Amlodipine was the most commonly prescribed medication, consistent with guideline-based management for older adults. Amlodipine is particularly beneficial for elderly as it helps in maintaining blood pressure control even among individuals with of comorbid conditions

including diabetes and chronic kidney disease without exacerbating these conditions (37). Health literacy levels were predominantly inadequate or problematic, indicating substantial challenges in effective disease self-management. Although overall medication adherence was relatively high, a notable proportion of patients remained non-adherent. The significant association between health literacy and adherence to medication (p= 0.002) underscores the importance of literacy skills in supporting consistent treatment behavior. Patients with good health literacy had better adherence to hypertension treatment regimens (38). These findings highlight the importance of implementing literacy-sensitive educational interventions to enhance hypertension management among this population.

Comparison with Previous Studies

Research assessing the correlation between health literacy and adherence to medication among elderly hypertensive patients in Indonesia remains limited. Previous studies were limited by a minimal sample of elderly participants (39), inclusion of non- elderly individuals (38) and the inclusion of patients without hypertension (40).

Limitations and Cautions

The cross-sectional design of this study precludes the establishment of causality between health literacy and adherence to medication. Adherence to medication was assessed by pill count, which may overestimate adherence. Additionally, factors such as cognitive function, socioeconomic status, and comorbidities were not fully controlled, and the use of self-reported data introduces the possibility of recall bias. The absence of confidence intervals in this study may limit the evaluation of the precision and robustness of the observed correlation.

Recommendations for Future Research

Future studies should explore how factors such as demographic characteristic may impair elderly ability to understand health-related information and engage in effective communication with healthcare professionals. It is also important to investigate literacy sensitive interventions that can improve decision-making, self management, and medication adherence. Given the high rates of diabetes and the common use of amlodipine in this population, future research should also focus on integrated approaches to managing cardiometabolic conditions and on evaluating the long-term effectiveness of widely used antihypertensive medications in elderly.

CONCLUSION

This study identified a statistically significant correlation between health literacy and adherence to medication in elderly having hypertension. Individuals with higher health literacy levels were more likely to adhere to their prescribed medications. The cross-sectional nature of the study precludes causal inference; therefore, the observed relationship should be considered an association rather than evidence of causation. These findings emphasize the important role of health literacy in promoting adherence to medication among elderly hypertensive patients and underscore the need for further studies involving diverse populations.

AUTHOR'S CONTRIBUTION STATEMENT

Irma Susanti and Riza Alfian contributed substantially to data collection, literature review and analysis, initial drafting of the manuscript, and reference management. All authors engaged in the interpretation of findings, reviewed and approved the final manuscript, and assume full accountability for the accuracy and integrity of the work presented. Yunita Nita and Abdul Rahem were primarily responsible for the conceptualization and design of the study, provided oversight and supervision throughout the research process, and conducted critical revisions to enhance the intellectual rigor of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors declare that no generative artificial intelligence (AI) tools or AI-assisted technologies were used in the conception, writing, editing, data analysis, or preparation of this manuscript. All content was developed entirely by the authors without assistance from AI-based tools.

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