



(RESEARCH ARTICLE)



THE RELATIONSHIP BETWEEN KNOWLEDGE OF HYPERTENSION COMPLICATIONS AND MEDICATION ADHERENCE AMONG WOMEN OVER 40 YEARS OF AGE IN ARDIMULYO VILLAGE, MALANG EGENCY, EAST JAVA, INDONESIA

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World Journal of Advanced Research and Reviews, 2026, 32(01), 1387–1395

Publication history: Received on 10 September 2026; revised on 17 October 2026; accepted on 19 October 2026

Article DOI: <https://doi.org/10.30574/wjarr.2026.32.1.2661>

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ABSTRACT

Background: The incidence of hypertension in Ardimulyo Village, Singosari District, Malang Regency, is the highest in northern Malang, East Java, Indonesia, and exceeds the national rate. Only 11.8% of respondents in this village receive regular treatment for hypertension, and 83.3% of patients are unaware of its complications. Previous studies have shown inconsistent associations between knowledge of hypertension complications and medication adherence. Therefore, this study aimed to determine the association between these two variables.

Methods: This cross-sectional study was conducted in Ardimulyo Village. The sample consisted of women aged over 40 years who had been diagnosed with hypertension by health workers, had received treatment within the last month, and

met the inclusion criteria. The variables were the level of knowledge regarding hypertension complications and adherence to medication. Data were collected using a questionnaire, and the association between variables was analyzed using the chi-square test at a 95% confidence level.

Results: The highest levels of knowledge regarding hypertension complications were found among participants aged 40–49 years (33.3%), those with a diploma or bachelor's degree (66.7%), and those who were employed (42.1%). Similarly, regarding medication adherence, the highest rates were found among the 40–49 age group (50%), those with a diploma or bachelor's degree (83.3%), and those who are employed (52.6%). Knowledge of hypertension complications was significantly associated with adherence to antihypertensive medication ($p = 0.001$).

Conclusion: Knowledge of hypertension complications is associated with adherence to antihypertensive medication. Improving knowledge of hypertension complications is essential for enhancing adherence to antihypertensive treatment.

Keywords: Knowledge Of Hypertension Complications, Women Over 40 Years of Age, Medication Adherence, Rural Areas.

1 INTRODUCTION

The incidence of hypertension in Ardimulyo Village, Singosari District, Malang Regency, is the highest in the northern region of Malang Regency, East Java, Indonesia(1). According to the 2025 Malang Regency Health Profile, 6,632 hypertension cases were identified among 10,532 screened residents, accounting for a prevalence of 62.9%. This rate exceeds the national prevalence of hypertension in Indonesia (34.1%)(2).

Nearly half of individuals with hypertension are unaware of their condition(3). According to the 2023 Indonesian Health Survey (SKI)(4) hypertension remains a major public health concern, as it increases morbidity and mortality due to cardiovascular complications(5).

Global data indicate a narrowing or even reversal of the urban-rural gap in hypertension prevalence(6). Although urban areas generally have a higher prevalence of hypertension due to lifestyle factors, recent evidence reveals a more complex and heterogeneous global pattern(7,8).

A preliminary survey conducted by the researchers in four neighborhood units in Randu Gembolo sub-village, Ardimulyo Village, identified 30 hypertension sufferers were found, with the majority of sufferers being women (26 people) and a median age of 40 years. Of these, 83.3% were unaware of hypertension-related complications. Regular antihypertensive treatment coverage in this village was only 11.8%(1). This low treatment coverage, coupled with limited knowledge of complications, increases the risk of hypertension-related complications among patients(9).

Patients with good knowledge of hypertension complications, such as stroke, renal failure, coronary heart disease, and heart failure, tend to have greater awareness of the importance of maintaining controlled blood pressure through treatment adherence. Conversely, limited knowledge of these complications may lead patients to neglect treatment, as they may not perceive hypertension as a serious condition(10).

Several previous studies have reported an association between knowledge of hypertension complications and adherence to antihypertensive medication(11). In contrast, other studies have found no significant association, suggesting that adherence is also influenced by other factors such as motivation, family support, access to health services, and adverse drug effects(12).

Given some inconsistent findings, the definitive relationship between knowledge regarding hypertension complications and adherence to treatment remains unclear. Therefore, this study aimed to examine the association between knowledge of hypertension complications and adherence to antihypertensive medication among hypertensive patients. The findings are expected to provide evidence on the importance of knowledge of hypertension complications in improving treatment adherence and supporting efforts to prevent hypertension-related complications in the community.

2 METHODS

This cross-sectional study aimed to determine the association between knowledge of hypertension complications and adherence to antihypertensive medication among women aged over 40 years in Ardimulyo Village, Singosari District, Malang Regency. The study sample comprised all women (92 persons) aged over 40 years with hypertension, who had taken antihypertensive medication for at least the past month and met the inclusion and exclusion criteria (total

sampling). Participants were required to be physically and mentally healthy, have been diagnosed with hypertension by a health worker, and have consumed antihypertensive medication for at least one month. Exclusion criteria were communication or cognitive impairment, inability to complete the questionnaire, severe illness during the study period, or presence of other disease complications.

Data were collected using a questionnaire comprising two main sections: one covering respondents' knowledge regarding hypertension complications, and the other addressing adherence to antihypertensive medication. The questionnaire underwent validity and reliability testing to assess the suitability of each item in measuring the research variables. Subsequently, the collected data were processed using SPSS software. A Chi-Square test was employed to analyze associations, with a 95% confidence interval.

The level of knowledge regarding hypertension complications is categorized as good, moderate, or low, based on criteria established by Arikunto (2010). Knowledge is considered "good" if respondents answer 76–100% of the questions correctly; "moderate" if 56–75% of the questions are answered correctly; and "low" if fewer than 55% of the questions are answered correctly. Similarly, adherence to taking antihypertensive medication is classified as "adherent" (if 76–100% of the questions are answered correctly) or "non-adherent" (if fewer than 75% of the questions are answered correctly).

This study received approval and ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga (reference number 27/EC/KEPK/FKUA/2026).

3 RESULTS

Respondents ranged in age from 40 to 79 years, with the largest proportion (38%) in the 50–59 age group. The majority (32.61%) had completed high school or an equivalent level of education, and 65.2% were housewives.

Table 1: Frequency Distribution of Respondents' Knowledge Levels Regarding Hypertension Complications Based on Age Group, Education Level, and Occupation.

Respondent Characteristics	Level of Knowledge						Total
	Low		Moderate		Good		
	Number (n)	percentage (%)	Number (n)	percentage (%)	Number (n)	percentage (%)	Number (n)
Age Group (years)							
40-49	3	25	5	41.7	4	33.3	12
50-59	17	48.6	12	34.3	6	17.1	35
60-69	12	37.5	12	37.5	8	25	32
70-79	7	53,8	5	38.5	1	7.7	13
Level of education							
No Schooling	7	63.6	4	36.4	0	0.0	11
Elementary School	16	59.3	9	33.3	2	7.4	27
Junior High School/equivalent	10	55.6	4	22.2	4	22.2	18
Senior High School/equivalent	6	20.0	15	50.0	8	30.0	29
Diploma, Bachelor’s Degree	0	0.0	2	33.3	4	66.7	6
Occupation							
Not employed	31	51.7	21	35.0	8	13.3	60
Trader	3	15.8	8	42.1	8	42.1	19
Retiree	5	38.5	5	38.5	3	23.1	13
Total	39	42.3	34	37	19	20.7	92

A total of 20.7% of the respondents possess good knowledge and 42.3% poor knowledge regarding the complications of hypertension; descriptively, Table 1 shows that respondents who work as traders possess good knowledge; the same applies to respondents in younger age groups and those with higher levels of formal education.

A total of 68.48% of the subjects were non-compliant with their treatment. Table 2 shows that treatment adherence was most frequently observed among those in the younger age group, those with a higher level of education, and those who work as traders.

Table 3 shows that the level of knowledge regarding hypertension complications is associated with adherence to antihypertensive medication ($p=0.001$). Descriptively, higher levels of knowledge correlate with better medication adherence.

Table 2: Frequency Distribution of Antihypertensive Medication Adherence Based on Respondents' Age Group, Education Level, and Occupation.

Respondent Characteristics	Medication Adherence				Total
	No		Yes		Number (n)
	Number (n)	percentage (%)	Number (n)	percentage (%)	
Age Group (years)					
40-49	6	50.0	6	50.0	12
50-59	26	74.3	9	25.7	35
60-69	19	59.4	13	40.6	32
70-79	12	92.3	1	7.7	13
Level of education					
No Schooling	10	90.9	1	9.1	11
Elementary School	24	88.9	3	11.1	27
Junior High School/equivalent	15	83.3	3	16.7	18
Senior High School/equivalent	13	43.3	17	56.7	30
Diploma, Bachelor's Degree	1	16.7	5	83.3	6
Occupation					
Not employed	45	75.0	15	25.0	60
Trader	9	47.4	10	52.6	19
Retiree	9	69.2	4	30.8	13
Total	63	68.48	29	31.52	92

Table 3: Frequency Distribution of Medication Adherence and Knowledge Level Regarding Hypertension Complications, and the Proportion Representing the Relationship Between the Two.

Knowledge of Hypertension Complications	Medication Adherence				Total	p value
	No		Yes			
	Number (n)	percentage (%)	Number (n)	percentage (%)	Number (n)	0.001
Low	36	92.3	3	7.7	39	
Moderate	20	58.8	14	41.2	34	
Good	7	36.8	12	63.2	12	
Total	63	68.48	29	31.52	92	

4 DISCUSSION

The results of this study indicate that 42.4% of participants had poor knowledge regarding hypertension complications. This proportion is lower than that reported among urban populations (55.21%) by Chekol et al. (2025), despite the participants here having higher levels of education and a disease duration of more than ten years(9). This discrepancy may be attributed to limited understanding of medical terminology, passive communication behavior, language barriers between doctors and patients, and the ineffectiveness of educational materials(13).

The lower level of knowledge regarding hypertension complications in rural areas compared to urban areas may be influenced by limited exposure to health information resulting from lower levels of formal education and the duration of the illness(9). In the rural setting, the selected respondents were patients who had been taking antihypertensive medication for at least one month; however, the duration of the illness was insufficient to raise awareness regarding hypertension complications.

Regarding formal education, respondents with no schooling or only primary school education predominantly fell into the "poor knowledge" category, whereas the majority of those with a bachelor's or diploma degree possessed good knowledge. Education influences an individual's ability to receive and comprehend health information(14) concerning hypertension and its complications. Respondents with higher levels of education tend to grasp the importance of hypertension treatment and complication prevention more readily than those with lower levels of education. These findings align with studies by Yulianto (2023) and Ayuning Siwi (2024), which indicate a link between education and the knowledge levels of hypertension patients(15,16).

However, these results are not supported by the study conducted by Gareth Leevs and Ireneous Soyiri (2015), which found that higher education did not improve knowledge regarding hypertension; this was attributed to the fact that higher education was limited to a small number of workers, while many workers with lower education levels did not utilize available health information to enhance their health knowledge, opting instead to seek direct medical care whenever they fell ill(17).

The disparity in health literacy between rural and urban areas suggests that strategies to improve health knowledge in rural settings should primarily focus on enhancing formal education and access to healthcare services. In contrast, in urban areas, such strategies should emphasize the provision of health information using more accessible language, delivered through diverse formats and media.

Regarding age characteristics, a higher proportion of respondents over the age of 60 fell into the "low knowledge" category compared to those aged 40–60. This indicates that age can influence an individual's ability to receive and comprehend health information(18). Older adults often experience memory decline and limitations in accessing health information, resulting in a lower level of understanding regarding hypertension. Conversely, respondents aged 40–60 tend to possess better knowledge, as they remain active in seeking health information through media and healthcare services. These findings align with research by Da Hae Kwon and Young Dae Kwon (2025), which indicates that individuals of working age tend to have better health knowledge than older adults(18).

In terms of occupation, the majority of respondents were housewives or unemployed; a larger proportion of this group fell into the "low knowledge" category compared to respondents working as traders or self-employed individuals. Working respondents tend to have broader access to information and social interactions, leading to superior health knowledge. Employment is associated with better health knowledge because income and occupational status provide access to resources that support physical and mental well-being(9,19,20).

Respondents with good knowledge regarding hypertension complications are expected to recognize hypertension as a treatable condition and, consequently, adhere to their antihypertensive medication regimen to prevent complications that could endanger their health. The study results indicate that 68.48% of respondents were non-adherent to their antihypertensive medication.

Adherent patients are those who take their medication regularly, in accordance with the prescribed dosage, schedule, and recommendations of healthcare providers, to achieve optimal blood pressure targets. Poorly controlled hypertension may lead to target organ damage and reduced quality of life (21). Medication adherence is a crucial factor in the success of hypertension therapy, as uncontrolled blood pressure increases the risk of complications such as stroke, heart failure, coronary heart disease, and kidney failure.

In this study, several reasons were identified for non-adherence to antihypertensive medication. Patients frequently forgot to take their medication, discontinued treatment when they felt healthy, failed to carry their medication while traveling, or delayed taking it due to boredom with long-term therapy. Additionally, some respondents cited financial

constraints, fear of side effects, and a lack of family support. These findings demonstrate that adherence to hypertension treatment is influenced not only by knowledge but also by psychological, social, and economic factors, as well as support from the patient's environment. These results are supported by Pedro D. F., Jose A. S., and Denise C. V. (2024)(22).

Regarding age groups, the 70–79 age group exhibited the highest rate of non-adherence at 92.3%, whereas the 40–49 age group demonstrated better adherence, with a compliance proportion of 50.0%. These results indicate that older respondents tend to struggle more with maintaining treatment adherence due to factors such as memory decline, physical limitations, reliance on family members, and treatment fatigue associated with long-term therapy. This finding is supported by research conducted by Kennedy et al.(23).

Among older women, treatment adherence can also be influenced by their dependence on family members for accessing healthcare services and attending routine check-ups. Conversely, younger respondents tend to better grasp the importance of consistent antihypertensive therapy, resulting in higher adherence rates compared to the older age group(24).

In terms of education level, respondents with no formal schooling showed the highest rate of non-adherence at 90.9%. The opposite was observed among those with higher levels of education. Education serves as a crucial factor in raising patient awareness regarding the need for regular and sustained hypertension treatment(25,26).

Based on respondents' employment characteristics, the unemployed showed the highest rate of non-adherence (75%), while traders and self-employed individuals showed better adherence, with a compliance rate of 52.6%. These findings indicate that employment status can influence access to health information and social experiences, as well as a respondent's ability to receive education regarding hypertension and its treatment. Actively employed respondents generally engage in broader social interactions and have greater access to information(27) than the unemployed, leading to a better understanding of the importance of consistent antihypertensive therapy. Broader social engagement also increases opportunities for respondents to obtain health information from their immediate environment and healthcare facilities(28).

Table 3 shows that the level of knowledge regarding hypertension complications is associated with adherence to antihypertensive medication ($p=0.001$); a higher level of knowledge concerning complications correlates with greater medication adherence. Individuals who understand the risks of hypertension complications tend to be more aware of the importance of maintaining controlled blood pressure through regular medication compared to those with limited knowledge(29).

Respondents who were younger, more highly educated, and employed demonstrated better knowledge regarding hypertension complications and greater adherence to taking antihypertensive medication. These findings align with research by Fahad M. Algabbani and Aljoharah M. Algabbani (2020), which identified patient knowledge of their condition as a key factor associated with non-adherence to antihypertensive medication. The presence of comorbidities and the concurrent use of multiple medications are significantly associated with treatment adherence; such patients were seven times more likely to exhibit good treatment adherence(30).

Research by Ramin Shiraly, Ali Khani Jeihooni, and Rozita Bakhshizadeh Shirazi (2022) also indicates a significant association between the perception of high risk regarding hypertension complications and adherence to antihypertensive therapy. Factors linked to better adherence include higher education levels, a non-smoking status, easy access to healthcare services, a shorter average duration of treatment, and a higher perceived risk of hypertension-related complications(31). Similarly, a study by Maha Rhamtallah et al. (2025) attributes the association between these variables to higher levels of education(32).

However, these findings are not supported by research from Sri Andala et al. (2024), which suggests that a deep understanding of severe organ complications can induce fear or an attitude of resignation (fatalism)(33). Likewise, a study by Surti Anggraeni et al. (2025) indicates that treatment adherence depends not only on the level of knowledge regarding hypertension complications but also on family and community support, particularly for the elderly(34). Despite having a good understanding of the complications associated with hypertension, they often fail to adhere to their medication regimen due to feeling healthy in their daily lives, cost issues, transportation constraints, medication unavailability, treatment fatigue, difficulties while away from home, changes in routine, or simply forgetfulness.

Understanding the risks of complications enhances individual awareness regarding the importance of blood pressure control through regular therapy. Sociodemographic characteristics, such as younger age, higher educational attainment, and employment status, serve as determinants positively associated with both knowledge and treatment adherence. Adherence is further influenced by clinical and psychosocial factors. Among older adults, adherence is predominantly determined by family and community support, as well as practical barriers, including treatment costs, healthcare access, treatment fatigue, and forgetfulness.

5 CONCLUSION

Knowledge of hypertension complications and medication adherence for hypertension were highest among younger, more educated, and employed individuals. The proportion with low knowledge of hypertension complications was lower in Ardimulyo village than in urban areas.

Younger, more highly educated, and employed individuals have a better understanding of the complications associated with hypertension, which in turn leads to greater adherence to antihypertensive medication. Knowledge of these complications is linked to treatment adherence. Given that many hypertensive patients have lower levels of education, are of advanced age, or are unemployed, support from family and the community, along with information about hypertension-related complications and improved access to healthcare services, is essential for enhancing treatment adherence.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

The authors would like to thank the community of Ardimulyo village, Singosari District, Malang Regency, East Java, Indonesia, along with all government officials of Ardimulyo village, Singosari District, and the regency. We also thank the Technical Implementation Unit for Public Health Training, Murnajati Lawang, for providing research training guidance and providing infrastructure and research areas. Likewise, we would like to thank the Department of Public Health Sciences - Preventive Medicine, and the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia for providing opportunities and guiding research in rural areas.

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

This study received ethical clearance from the Ethics Committee for Health Research, Universitas Airlangga, Surabaya, Indonesia (No. 27/EC/KEPK/FKUA/2026).

Statement of informed consent

Informed consent was obtained from all individual participants before the study was conducted.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication. All authors contributed to the article and approved the submitted version.

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