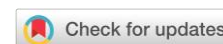


Level of Knowledge about Hypertension among Older Adults in Relation to Age, Sex, and Educational Attainment: A Descriptive Study

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ABSTRACT

Background: Hypertension is a common degenerative condition among older adults and is often under-recognized due to its asymptomatic nature. Adequate knowledge is essential for effective self-management and prevention. This study aimed to describe hypertension knowledge and the sociodemographic characteristics of older adults in Kelurahan Tinoor Satu, Tomohon City, Indonesia.

Methods: A descriptive quantitative design with a cross-sectional approach was used. A purposive sample of 103 older adults was drawn from a population of 138 residents. Data were collected using a modified 28-item closed-ended questionnaire, adapted from Aspuah (2013), scored on a Guttman scale and categorized as good (18-28 correct), sufficient (9-17), or poor (0-8) knowledge, then analyzed univariately using frequencies and percentages. Ethical approval was obtained from the Health Research Ethics Committee of STIKes Bethesda Tomohon.

Results: Most respondents were aged 60–74 years (76.7%), female (57.3%), and had primary education (48.5%). Overall, 75.7% had sufficient knowledge, 20.4% had good knowledge, and 3.9% had poor knowledge about hypertension. Age, sex, and education were significantly associated with knowledge ($p < 0.05$). Good knowledge was more common among respondents aged 60–74 years than those aged 75–90 years (24.1% vs. 8.3%; $p = 0.018$), females than males (28.8% vs. 9.1%; $p = 0.032$), and those with higher education (8.0% among primary-educated respondents to 100.0% among those with higher education; $p < 0.001$).

Conclusion: Hypertension knowledge was predominantly sufficient, but was significantly associated with age, sex, and education. Literacy-appropriate health education through community health programs is needed to further improve knowledge and support hypertension self-management.

INTRODUCTION

Population ageing is one of the most significant demographic transitions of the twenty-first century. Between 2015 and 2050, the proportion of the world's population aged 60 years and older is projected to nearly double, from 12% to 22%, and by 2050 the number of people in this age group is expected to reach approximately 2.1 billion, with the majority living in low- and middle-income countries (World Health Organization, 2025b). As individuals move into older age, physiological decline across multiple organ systems increases their vulnerability to degenerative and non-communicable diseases compared with younger adults (Ariyanti et al., 2020). Among these conditions, hypertension remains one of the most prevalent and consequential.

Hypertension, or high blood pressure, is defined as a sustained elevation of systolic blood pressure to 140 mmHg or higher and/or diastolic blood pressure to 90 mmHg or higher, confirmed on at least two separate occasions (Mancia *et al.*, 2023; Wirakhmi & Novitasari, 2021). Because it rarely produces overt symptoms in its early stages, hypertension is frequently referred to as a “silent killer” (Wirakhmi & Novitasari, 2021). Established risk factors include advancing age, sex, obesity, physical inactivity, and high dietary sodium intake, several of which become more prevalent, or more difficult to modify, as individuals grow older (Delfriana *et al.*, 2022). Globally, an estimated 1.4 billion adults aged 30–79 years were living with hypertension in 2024, of whom nearly half remained unaware of their condition and fewer than one in four had it adequately controlled (WHO, 2025a). The World Health Organization's first global report on hypertension likewise emphasized that roughly four in five people with hypertension are not adequately treated, even though scaling up detection and management could avert an estimated 76 million deaths worldwide between 2023 and 2050 (WHO, 2023).

In Indonesia, the Ministry of Health estimated 63,309,620 hypertension cases in 2018, contributing to 427,218 deaths nationally (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], 2019). More recent national survey data indicate that hypertension prevalence among adults aged 18 years and older declined to 30.8% in 2023 from 34.1% previously, although treatment coverage remains low, with only a small proportion of those diagnosed reporting regular medication use (Santika, 2024). At the provincial level, North Sulawesi recorded a hypertension prevalence of 33.1% (Badan Pusat Statistik [BPS], 2019), and older adults made up 48.26% (male) and 51.74% (female) of the province's population aged 60 years and above in 2022 (BPS, 2024). Within Tomohon City specifically, 14,815 residents were recorded as older adults in 2023 (BPS Kota Tomohon, 2024).

Adequate knowledge is widely regarded as a foundation for healthy behavior, since behavior change is more likely to be sustained when grounded in correct understanding rather than habit alone (Munawaroh, 2021). Among older adults with hypertension, better knowledge of the condition, its risk factors, and its management has been associated with improved self-care behavior, including physical activity and weight control (Gusty *et al.*, 2022). Conversely, insufficient knowledge and awareness have repeatedly been linked to poor blood pressure control across both high-income and low- and middle-income settings; in the United States, for example, awareness of hypertension among adults aged 60 years and older reached 73.7%, yet only 29.2% achieved adequate blood pressure control (Fryar *et al.*, 2024). Evidence from South Asia suggests that knowledge levels vary considerably by education, sex, and comorbidity status, with education consistently emerging as one of the strongest correlates of hypertension awareness and knowledge (Ranjan *et al.*, 2025; Ullah, 2025).

Several descriptive studies conducted in different regions of Indonesia have reported considerable variation in the knowledge level of older adults regarding hypertension, ranging from a predominance of good knowledge in some settings to a predominance of poor knowledge in others (Elmiaty, 2022; Kristiana, 2022; Kumoro & Kumala, 2022; Yusril, 2023). This variability suggests that hypertension knowledge among older adults is shaped by local context, including the sociodemographic composition of the community, and cannot be assumed to be uniform across settings.

Kelurahan Tinoor Satu, located within the working area of Tinoor Community Health Center (Puskesmas Tinoor) in North Tomohon District, Tomohon City, is home to 138 registered older adults. A preliminary study by the researchers, including brief interviews with three older residents, indicated that some older adults had limited understanding of hypertension and its complications and were not consistent in taking antihypertensive medication. To date, no study describing the level of knowledge about hypertension among older adults in this specific working area has been conducted. Given this gap, and considering that a population's demographic profile, particularly age structure, sex distribution, and educational attainment, provides essential context for interpreting knowledge levels and designing targeted health education (Ranjan *et al.*, 2025; Ullah, 2025), this study aimed to describe the level of knowledge about hypertension among older adults in Kelurahan Tinoor Satu together with their distribution by age, sex, and educational attainment.

METHODS

Design and Setting

This study used a descriptive quantitative design with a cross-sectional approach. It was conducted in Kelurahan Tinoor Satu, North Tomohon District, Tomohon City, Indonesia, within the working area of Tinoor Community Health Center, during 2025.

Population and Sample

The population comprised all 138 older adults (aged ≥ 60 years) residing in Kelurahan Tinoor Satu. A sample of 103 respondents was selected using a non-probability, purposive sampling technique. Older adults were eligible if they were permanent residents of Kelurahan Tinoor Satu, were able to communicate and respond to the questionnaire independently or with minimal assistance, and were willing to participate voluntarily; older adults with severe cognitive impairment or acute illness at the time of data collection were excluded.

Instrument

Data were collected using a structured, closed-ended questionnaire measuring knowledge about hypertension, adapted with modification from Aspuah's (2013) compendium of health research questionnaires and instruments, together with items on respondent age, sex, and education. The final instrument consisted of 28 knowledge statements, comprising 19 positively worded items (numbers 1–3, 5–9, 11–17, 19–20, 23–25, and 27–28) and 6 negatively worded items (numbers 4, 10, 18, 21, 22, and 26). Respondents indicated their answer by marking a checkmark (✓) in the appropriate column. Each correct answer was scored 1 and each incorrect answer 0, following a Guttman scaling approach, yielding a total score range of 0–28 that was treated as an ordinal-level measure. Total scores were categorized as good knowledge (18–28 correct responses), sufficient knowledge (9–17), or poor knowledge (0–8).

Data Collection Procedure

After receiving ethical approval, the researchers, assisted by local health cadres, approached eligible older adults at their place of residence and at community activities, including the elderly integrated health post (Posyandu Lansia). The purpose and procedures of the study were explained, and informed consent was obtained before the questionnaire was administered. For respondents with visual or literacy limitations, items were read aloud by the researcher, and responses were recorded exactly as stated by the respondent to minimize interviewer bias.

Data Analysis

Data were analyzed using univariate and bivariate analyses. Categorical variables (age group, sex, education level, and knowledge category) were summarized as frequencies and percentages using Microsoft Excel 2021. Bivariate analysis was performed to examine the association between sociodemographic characteristics (age group, sex, and education level) and hypertension knowledge level using the Chi-square test or Fisher's exact test when appropriate. Statistical significance was determined at a p -value < 0.05 . The findings were interpreted in accordance with the study objectives and relevant literature.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of STIKes Bethesda Tomohon (Approval No. 132/STIKES/DIII/KT/III/2024), dated March 25, 2024. All participants were informed about the purpose and procedures of the study, and informed consent was obtained from each participant before data collection. Participation was voluntary, and the confidentiality and privacy of all participants were maintained throughout the study.

RESULTS

A total of 103 older adults participated in this study. Their sociodemographic characteristics and level of knowledge about hypertension are presented in Tables 1–2 and summarized visually in Figure 1.

Table 1. Sociodemographic Characteristics of Respondents (N = 103)

Characteristic	n	%
Age group		
60–74 years	79	76.7

Characteristic	n	%
75–90 years	24	23.3
Sex		
Female	59	57.3
Male	44	42.7
Education level		
Primary school	50	48.5
Junior secondary school	29	28.2
Senior secondary school	23	22.3
Higher education	1	1.0
Total	103	100.0

As shown in Table 1, most respondents were aged 60–74 years (76.7%, $n = 79$), while 23.3% ($n = 24$) were aged 75–90 years. Most respondents were female (57.3%, $n = 59$), while 42.7% ($n = 44$) were male. Educational attainment was generally low: 48.5% ($n = 50$) of respondents had completed only primary school, 28.2% ($n = 29$) junior secondary school, 22.3% ($n = 23$) senior secondary school, and only 1.0% ($n = 1$) had attained higher education.

Table 2. Distribution of Respondents by Level of Knowledge about Hypertension (N = 103)

Knowledge Level	n	%
Good (18–28 correct)	21	20.4
Sufficient (9–17 correct)	78	75.7
Poor (0–8 correct)	4	3.9
Total	103	100.0

Regarding knowledge about hypertension (Table 2), most respondents (75.7%, $n = 78$) were categorized as having sufficient knowledge, 20.4% ($n = 21$) had good knowledge, and 3.9% ($n = 4$) had poor knowledge.

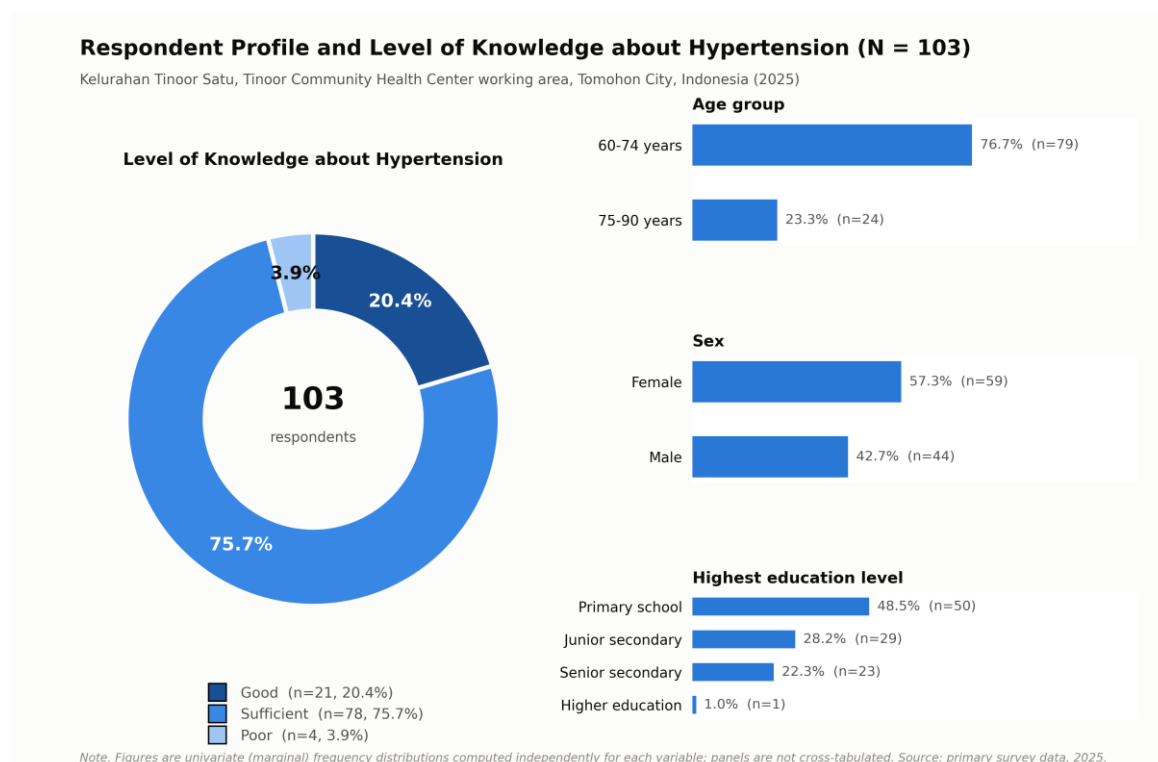


Figure 1. Respondent sociodemographic profile (age, sex, education) and level of knowledge about hypertension (N = 103).

Table 3. Association between Sociodemographic Characteristics and Knowledge Level about Hypertension (N = 103)

Characteristic	Good n (%)	Sufficient n (%)	Poor n (%)	p-value
Age group				0.018
60–74 years	19 (24.1)	59 (74.7)	1 (1.3)	
75–90 years	2 (8.3)	19 (79.2)	3 (12.5)	
Sex				0.032
Female	17 (28.8)	40 (67.8)	2 (3.4)	
Male	4 (9.1)	38 (86.4)	2 (4.5)	
Education level				<0.001
Primary school	4 (8.0)	43 (86.0)	3 (6.0)	
Junior secondary school	5 (17.2)	23 (79.3)	1 (3.4)	
Senior secondary school	11 (47.8)	12 (52.2)	0 (0.0)	
Higher education	1 (100.0)	0 (0.0)	0 (0.0)	

Table 3 shows that age group, sex, and education level were all significantly associated with knowledge about hypertension ($p < 0.05$). Respondents aged 60–74 years had a higher proportion of good knowledge than those aged 75–90 years (24.1% vs. 8.3%; $p = 0.018$). Female respondents were also more likely to have good knowledge than male respondents (28.8% vs. 9.1%; $p = 0.032$). Education level demonstrated the strongest association, with the proportion of good knowledge increasing substantially with higher educational attainment, from 8.0% among respondents with primary education to 100.0% among those with higher education ($p < 0.001$).

DISCUSSION

This study found that most older adults in Kelurahan Tinoor Satu had a sufficient level of knowledge about hypertension (75.7%), while 20.4% demonstrated good knowledge and only 3.9% had poor knowledge. This distribution indicates that although most respondents possessed a basic understanding of hypertension, their knowledge had not yet reached an optimal level. Similar findings have been reported in other Indonesian settings, where sufficient knowledge was also the predominant category among older adults (Kristiana, 2022). In contrast, a study among institutionalized older adults reported a more favorable distribution, with a larger proportion demonstrating good knowledge about hypertension diet (Kumoro & Kumala, 2022). Differences between studies may reflect variations in study populations, access to health information, exposure to health education, and healthcare support. Meanwhile, higher proportions of poor knowledge have been reported among older adults in other community health center settings (Elmiaty, 2022; Yusril, 2023). These variations suggest that hypertension knowledge among older adults differs across community settings and may be influenced by sociodemographic and healthcare-related characteristics.

The sociodemographic characteristics of the respondents provide important context for understanding the observed knowledge levels. Nearly half of the respondents had completed only primary education (48.5%), while only one respondent (1.0%) had attained higher education. This relatively low educational attainment may represent an important barrier to acquiring and processing health information. Formal education can influence an individual's ability to access, understand, evaluate, and apply health information in daily life (Munawaroh, 2021). Previous evidence has also identified educational attainment as an important determinant of hypertension awareness and knowledge (Ranjan et al., 2025; Ullah, 2025). Therefore, the concentration of respondents in the sufficient rather than good knowledge category may partly reflect the generally low educational background of the study population.

The findings in Table 3 demonstrated that age group, sex, and educational attainment were significantly associated with hypertension knowledge level. Age group was significantly associated with knowledge ($p = 0.018$), with respondents aged 60–74 years having a higher proportion of good knowledge than those aged 75–90 years (24.1% vs. 8.3%). This finding may indicate that younger older adults are more capable of accessing, processing, and retaining health information than those in the older age group. Age-related changes in cognitive function, hearing, vision, and information processing may make health education more challenging among adults aged 75 years and above (Astuti et al., 2023; Damanik & Hasian, 2019). In addition, reduced participation in community activities and healthcare utilization may further limit opportunities for acquiring health information among older adults (Minarti, 2022).

Sex was also significantly associated with knowledge level ($p = 0.032$). Female respondents had a higher proportion of good knowledge than male respondents (28.8% vs. 9.1%). This finding is consistent with previous research reporting that women were more likely to have adequate hypertension knowledge (Ranjan et al., 2025). However, other research has found no significant difference in hypertension awareness according to sex (Ullah, 2025). The higher proportion of good knowledge among women in the present study may be related to greater engagement with health-related activities and healthcare services, which could provide more opportunities to receive information about chronic disease prevention and management. Nevertheless, these potential mechanisms were not directly measured in this study and should therefore be interpreted cautiously.

Educational attainment demonstrated the strongest association with hypertension knowledge in this study ($p < 0.001$). The proportion of respondents with good knowledge increased from 8.0% among those with primary education to 17.2% among those with junior secondary education and 47.8% among those with senior secondary education. The single respondent with higher education was categorized as having good knowledge. This gradient supports the important role of education in shaping health knowledge and is consistent with previous evidence showing that educational attainment is strongly associated with hypertension awareness and health-information processing (Munawaroh, 2021; Ullah, 2025). Higher educational attainment may improve an individual's ability to understand health information, evaluate its relevance, and apply it to disease prevention and self-management. However, the finding for the higher-education category should be interpreted cautiously because it was based on only one respondent and therefore cannot be considered representative of that educational group.

The significant associations identified in Table 3 suggest that hypertension education should not be delivered using a uniform approach for all older adults. Differences in age, sex, and particularly educational attainment should be considered when designing community-based health education. Older adults with lower educational attainment may require simpler language, repeated explanations, visual materials, and practical demonstrations to facilitate understanding. Similarly, older adults in the 75–90-year age group may benefit from more individualized education and greater involvement of family members or caregivers. These approaches are particularly relevant because sensory changes, reduced mobility, and decreased participation in community activities may limit health-information acquisition among older adults (Minarti, 2022).

Knowledge is important for hypertension prevention and management because adequate understanding of the disease can support appropriate self-care behaviors. Previous research has shown that higher hypertension knowledge is associated with more appropriate self-management practices among older adults in community settings (Anitha, 2021). Better knowledge has also been associated with adherence to weight-management and physical-activity recommendations, although the relationship has not been consistent across all aspects of hypertension self-care, including medication and dietary adherence (Gusty et al., 2022). These findings indicate that knowledge is an important foundation for healthy behavior but may not be sufficient by itself to produce sustained behavioral change. Structured self-management support and continuous health education may therefore be needed to translate knowledge into daily practices. Structured self-management support has been shown to improve self-care adherence and health status among older adults compared with usual care (Putri et al., 2021).

The findings have practical implications for hypertension prevention and health promotion in Kelurahan Tinoor Satu. Because educational attainment was strongly associated with knowledge level, health education should be designed to accommodate individuals with limited literacy. Educational activities through Posyandu Lansia and routine outreach programs at Tinoor Community Health Center should use simple language, visual materials, demonstrations, repetition, and interactive communication rather than relying primarily on written information. Particular attention should be given to respondents with lower educational attainment and those in the older age group. Health cadres and family members may also play an important role in reinforcing information received from healthcare workers. The content should emphasize practical hypertension-control measures, including regular blood pressure monitoring, medication adherence, reduction of dietary salt intake, regular physical activity, healthy dietary practices, and stress management (Kemenkes RI, 2023).

This study has several limitations. First, its cross-sectional design limits the ability to establish causal relationships between sociodemographic characteristics and hypertension knowledge. Although significant associations were identified between age, sex, education level, and knowledge, these findings should not be interpreted as evidence that these characteristics directly cause differences in knowledge. Second, the use of purposive sampling and the single-location study setting limits the generalizability of the findings to older adults in other communities. Third, the higher-education category contained only one respondent, making the observed 100% proportion of good knowledge in this group unstable and requiring cautious interpretation. Fourth, knowledge was assessed using an interviewer-assisted questionnaire, which may introduce social desirability or interviewer-related bias. Future studies should use larger and more representative samples and consider additional factors such as duration of hypertension, family history, access to health information, health literacy, healthcare utilization, and participation in community health programs. Longitudinal or intervention studies would also be useful to determine whether targeted, literacy-appropriate health education can improve hypertension knowledge and subsequently strengthen self-management behaviors among older adults.

CONCLUSION

Among 103 older adults in Kelurahan Tinoor Satu, most respondents had sufficient knowledge about hypertension (75.7%), while 20.4% had good and 3.9% had poor knowledge. Respondents were predominantly aged 60–74 years, female, and had primary-level education. Age, sex, and education were significantly associated with hypertension knowledge ($p < 0.05$), with good knowledge more common among those aged 60–74 years (24.1% vs. 8.3%; $p = 0.018$), females (28.8% vs. 9.1%; $p = 0.032$), and respondents with higher education (8.0% to 100.0%; $p < 0.001$). These findings highlight the need for

routine, literacy-appropriate hypertension education through community health programs, particularly elderly integrated health posts, to improve knowledge and support self-management.

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AUTHOR CONTRIBUTIONS

ARR, CDP, ETH, and LIL contributed to the conception and design of the study, data collection and analysis, interpretation of the results, manuscript drafting, critical revision, and final approval of the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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