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Original Article

KNOWLEDGE OF HYPERTENSION PREVENTION AND BLOOD PRESSURE STATUS AMONG OLDER ADULTS IN SEKARGADUNG, PASURUAN, INDONESIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Hypertension is a major health problem among older adults and can lead to cardiovascular, cerebrovascular, and renal complications. Because many risk factors are modifiable, knowledge of preventive measures may support healthier daily practices and routine blood pressure monitoring. Evidence linking prevention knowledge with directly measured blood pressure status in community-dwelling older adults remains limited in the study setting.
Objectives: This study examined the relationship between knowledge of hypertension prevention and blood pressure status among older adults in Sekargadung, Pasuruan, Indonesia.
Methods: A quantitative analytical cross-sectional study was conducted from October to November 2025. The accessible population comprised 43 adults aged 60 years or older. A minimum sample of 30 was calculated using Slovin's formula with a 10% margin of error, and participants were recruited purposively. Prevention knowledge was assessed using a 20-item questionnaire, and blood pressure was measured using a sphygmomanometer. Descriptive statistics and Spearman rank correlation were used for analysis.
Results: Participants were 61-72 years old, with a mean age of 66.7 years, and 60.0% were men. Nineteen participants had adequate prevention knowledge and 11 had good knowledge. Blood pressure status was normal in 15 participants, prehypertensive in 11, stage 1 hypertensive in three, and stage 2 hypertensive in one. Among participants with good knowledge, 72.7% had normal blood pressure, compared with 36.8% of those with adequate knowledge. Prevention knowledge was significantly associated with blood pressure status (Spearman's rho = 0.383, p = 0.037).
Conclusion: Better knowledge of hypertension prevention was associated with a more favorable blood pressure category, although the relationship was weak. Continuous, age-appropriate health education should be combined with regular blood pressure monitoring and practical support for lifestyle change. The cross-sectional design does not establish causality.

Keywords: Blood Pressure, Health Education, Hypertension Prevention, Knowledge, Older Adults.

INTRODUCTION

Hypertension remains one of the most important noncommunicable disease challenges worldwide. The World Health Organization estimated that approximately 1.4 billion adults aged 30-79 years were living with hypertension in 2024, while large proportions were unaware of their condition or had not achieved adequate control (World Health Organization, 2025). The condition is frequently asymptomatic, but persistent elevation of blood pressure increases the risk of stroke, coronary heart disease, heart failure, and kidney disease. These consequences are particularly important in older adults because vascular stiffness, accumulated exposure to risk factors, multimorbidity, and functional limitations can increase both susceptibility and the burden of complications (Unger et al., 2020).

In Indonesia, hypertension is strongly associated with modifiable factors such as excessive salt and fat intake, insufficient physical activity, smoking, obesity, and chronic stress (Dewati et al., 2023; Faisal et al., 2022; Kartika et al., 2021). Prevention and control therefore require more than pharmacological treatment. Recommended measures include reducing dietary sodium, increasing fruit and vegetable intake, maintaining a healthy weight, engaging in safe regular physical activity, avoiding tobacco and excessive alcohol use, managing stress, adhering to prescribed medication when indicated, and monitoring blood pressure regularly (Fauziah & Mulyani, 2022; Unger et al., 2020).

The conceptual basis of this study is the PRECEDE-PROCEED framework, in which predisposing factors, enabling factors, and reinforcing factors may shape health-related behavior (Green & Kreuter, 2005). Knowledge is a predisposing cognitive factor that may shape how individuals recognize risk, evaluate the consequences of hypertension, and select preventive actions. Within the conceptual framework used in the source study, prevention knowledge was expected to influence behavior, while access to health services and blood pressure measurement facilities acted as enabling factors and family support, health-worker education, and community leadership acted as reinforcing factors. This framework implies that knowledge can initiate preventive action but is unlikely to be sufficient by itself. Older adults may understand general recommendations yet still face barriers related to habits, finances, mobility, family support, health literacy, or access to continuous care (Lactona & Cahyono, 2024; Sijabat et al., 2020).

Previous Indonesian studies have reported associations between hypertension knowledge and preventive behavior. Elfina et al. (2023) found that people with poorer knowledge were more likely to report inadequate preventive behavior, while Irianti et al. (2021) identified a significant relationship between knowledge and preventive action among older adults. However, much of the available evidence focuses on self-reported behavior rather than the relationship between prevention knowledge and an objectively measured blood pressure category. Evidence from a specific community is also needed because health information, social support, dietary practices, and access to screening vary across settings.

The study setting was Sekargadung Urban Village, Pasuruan City, East Java, where older adults participate in community-based health activities and primary-care services. Local observations underlying the original study indicated that preventive practices and routine blood-pressure checks were not consistently performed. The specific research gap addressed here is not whether prevention knowledge is associated with behavior, but whether a self-

reported prevention-practice category is associated with a study-defined blood-pressure category in this community.

Accordingly, this study aimed to determine the association between hypertension-prevention practice and study-defined MAP category among older adults in Sekargadung. The hypothesis was stated as an association hypothesis: participants with a higher prevention-practice category would tend to have a more favorable study-defined MAP category. No causal effect of prevention practice on blood pressure was hypothesized or tested.

METHODS

Study Design

This study used a quantitative analytical correlational design with a cross-sectional approach. Hypertension-prevention practice was treated as the independent variable and study-defined MAP category as the dependent variable. Both variables were assessed during the same study period; therefore, temporal sequence and causality could not be established.

Settings

The study was conducted in Sekargadung Urban Village, Pasuruan City, East Java, Indonesia, from October to November 2025. Participants were recruited through the local older-adult community health service and were assessed in coordination with health personnel from the Sekargadung primary health-care center.

Research Subject

The accessible population comprised 43 community-dwelling adults aged ≥60 years. The original study used Slovin's formula with a 10% margin of error and obtained a target of approximately 30 participants. In this revised manuscript, this calculation is described as a pragmatic finite-population sampling calculation rather than as a power-based justification for correlation analysis. The study did not have an a priori effect-size/power calculation for Spearman correlation, which limits the precision and statistical stability of the estimate.

Participants were recruited purposively. The inclusion criteria were residence in Sekargadung, age ≥60 years, willingness to participate, and ability to complete the questionnaire and blood-pressure assessment. Records with incomplete questionnaire or blood-pressure data were excluded. Of the 43 accessible individuals, 30 had complete data and were included in the analysis. Thirteen individuals were not included; the source manuscript did not document individual reasons for non-inclusion. This limitation is acknowledged because it prevents assessment of whether the included and non-included individuals differed systematically.

Instruments

The independent variable was reassessed during revision because the original manuscript labeled it "knowledge," whereas the questionnaire used frequency-based response options (always, often, sometimes, never). Such response options are more consistent with self-reported practice frequency than factual knowledge. The 20 items covered salt restriction, physical activity, weight control, smoking and alcohol avoidance, stress management, healthy eating, medication-related practices, and routine blood-pressure checks. Each item was scored from 1 to 4, giving a total score of 20–80. The original categories were retained for comparability with the dataset: 65–80 = good practice, 45–64 = adequate practice, and 20–44 = poor practice. No participant was in the poor category.

The source manuscript states that validity testing had been conducted, but it did not provide the item-level validity coefficients, reliability coefficient, expert-panel details, instrument-development process, or testing sample. These psychometric details cannot be reconstructed from the available study record and are therefore not invented in this revision. The absence of these data is treated as a methodological limitation. The cut-off points are also study-specific and should not be interpreted as universally validated practice thresholds.

Blood pressure was measured after approximately 5–10 minutes of seated rest, with the back supported, feet uncrossed, and the arm supported at heart level. The source manuscript states that a sphygmomanometer was used and that trained personnel from the local primary health-care center assisted with measurement. However, the available study record does not specify the device manufacturer/model, calibration documentation, number of repeated readings, interval between readings, arm used, or whether the reported value represented a single reading or an average. These details are therefore reported as unavailable rather than inferred.

Mean arterial pressure (MAP) was calculated using $MAP = DBP + 1/3(SBP - DBP)$, equivalently $MAP = (SBP + 2\times DBP)/3$. The original dataset used four operational MAP categories: 70–92 mmHg, 93–106 mmHg, 107–119 mmHg, and 120–132 mmHg. Because these thresholds are not the standard diagnostic classification of hypertension, they are referred to throughout this revision as "study-defined MAP categories." They should not be interpreted as equivalent to normal blood pressure, prehypertension, stage 1 hypertension, or stage 2 hypertension. Current clinical guidelines classify blood pressure primarily using systolic and diastolic values and emphasize standardized/repeated measurements for clinical assessment.

Data Collection

After receiving an explanation of the study, participants who agreed to take part signed a written informed-consent form. The researcher administered the demographic and hypertension-prevention questionnaire. Trained personnel from the local primary health-care center assisted with blood pressure measurement, and results were recorded on a prepared data form. Demographic variables included age, sex, education, occupation, and marital status.

Data Analysis

Data were edited, coded, scored, and tabulated. Categorical variables were summarized using frequencies and percentages, while age was summarized using the mean, standard deviation, and range. The primary association was analyzed using Spearman rank correlation between prevention-practice category and study-defined MAP category.

For the ordinal analysis, the final dataset coded prevention practice as 1 = adequate and 2 = good; the study-defined MAP categories were coded in the direction used in the original analysis so that a higher code represented a more favorable blood-pressure category. The exact original numerical MAP coding should be verified against the raw dataset before submission because the source manuscript did not reproduce the numerical codes. The reported rho therefore should be interpreted as an association based on the original coding rather than as a causal or clinically predictive effect.

The analysis used categorized variables rather than the original continuous questionnaire score or continuous systolic/diastolic measurements. Categorization may reduce statistical information and power. Because the source manuscript does not provide raw participant-level scores or blood-pressure values, a reanalysis using continuous measures could not be performed in this revision. No multivariable adjustment was performed for age, sex, body mass

index, diet, sodium intake, physical activity, smoking, alcohol use, medication use, duration of hypertension, comorbidity, family history, stress, or health-service utilization.

Ethical Considerations

The research protocol was declared ethically acceptable by a health research ethics committee under approval No. DP.04.03/F.XIII.31/0053/2026. Participation was voluntary, and written informed consent was obtained from all participants. Personal identifiers were removed from the analytical dataset, participant information was coded, and the confidentiality of questionnaire and blood pressure data was maintained. Permission to conduct the study was also obtained from the local study site.

RESULTS

The 30 participants ranged in age from 61 to 72 years, with a mean age of 66.7 years and a standard deviation of 2.9 years. Most participants were aged 60-69 years (90.0%), 60.0% were men, and 76.7% had completed senior secondary education. Farmers constituted the largest occupational group (40.0%), and 86.7% were married (Table 1).

Table 1. Characteristics of the study participants (n = 30).

Characteristic	n	%
Age, mean (standard deviation), years	66.7 (2.9)	-
Age range, years	61-72	-
Age 60-69 years	27	90.0
Age 70-79 years	3	10.0
Sex: male	18	60.0
Sex: female	12	40.0
Education: primary school	3	10.0
Education: junior secondary school	4	13.3
Education: senior secondary school	23	76.7
Occupation: self-employed	3	10.0
Occupation: private employee	5	16.7
Occupation: farmer	12	40.0
Occupation: homemaker/not working	10	33.3
Marital status: married	26	86.7
Marital status: divorced/widowed	4	13.3

Prevention-Practice and MAP Categories

Nineteen participants (63.3%) had adequate knowledge of hypertension prevention and 11 (36.7%) had good knowledge; no participant was categorized as having poor knowledge. Fifteen participants (50.0%) had normal blood pressure status. The remaining participants were categorized as prehypertensive (36.7%), stage one hypertensive (10.0%), or stage two hypertensive (3.3%) (Table 2).

Table 2. Distribution of prevention-knowledge and blood pressure-status categories (n = 30).

Variable and category	n	%
Hypertension-prevention knowledge		
Good	11	36.7
Adequate	19	63.3
Poor	0	0.0
Blood pressure status		
Normal	15	50.0
Prehypertension	11	36.7
Stage one hypertension	3	10.0
Stage two hypertension	1	3.3

Association Between Prevention Practice and MAP Category

Among participants with good prevention knowledge, eight of 11 (72.7%) had normal blood pressure and three (27.3%) were prehypertensive; none were classified with stage one or stage two hypertension. Among participants with adequate knowledge, seven of 19 (36.8%) had normal blood pressure, eight (42.1%) were prehypertensive, three (15.8%) had stage one hypertension, and one (5.3%) had stage two hypertension (Table 3).

Table 3. Cross-tabulation of hypertension-prevention knowledge and blood pressure status.

Knowledge category	Blood pressure status, n (%)				Total, n (%)
	Normal	Prehypertension	Stage one	Stage two	
Good	8 (72.7)	3 (27.3)	0 (0.0)	0 (0.0)	11 (100.0)
Adequate	7 (36.8)	8 (42.1)	3 (15.8)	1 (5.3)	19 (100.0)
Total	15 (50.0)	11 (36.7)	3 (10.0)	1 (3.3)	30 (100.0)

Spearman rank correlation showed a statistically significant association between prevention-practice category and study-defined MAP category (rho = 0.383, p = 0.037, n = 30). The magnitude was weak. Because the sample was small and the highest MAP category

contained only one participant, the coefficient should be interpreted cautiously. Statistical significance in this sample does not establish clinical importance or causality.

DISCUSSION

The principal finding was a statistically significant but weak relationship between knowledge of hypertension prevention and blood pressure status among older adults in Sekargadung. Participants with good knowledge were more frequently classified with normal blood pressure than those with adequate knowledge, and no participant in the good-knowledge group was classified with stage one or stage two hypertension. The result supports the study's conceptual proposition that prevention knowledge is related to health status, while the modest coefficient indicates that knowledge is not the only determinant.

The finding is consistent with prior Indonesian evidence linking knowledge to hypertension-prevention behavior. Elfina et al. (2023) reported a significant association between knowledge and preventive behavior, with poorer knowledge associated with a greater likelihood of inadequate prevention. Irianti et al. (2021) similarly found a significant relationship between hypertension knowledge and preventive action among older adults. Although those studies emphasized behavior rather than measured blood pressure status, their findings support the pathway proposed in the present study: knowledge may increase awareness of risk and facilitate choices that protect cardiovascular health.

A plausible mechanism begins with risk recognition. Older adults who understand the consequences of excessive salt intake, physical inactivity, smoking, obesity, and unmanaged stress may perceive hypertension prevention as personally relevant. This perception can strengthen motivation to choose lower-sodium foods, remain physically active, monitor blood pressure, and seek care when needed. Repeated adoption of these practices can contribute to improved blood pressure control. Knowledge also helps individuals interpret health advice, distinguish preventive recommendations from misconceptions, and communicate more effectively with health workers (Lactona & Cahyono, 2024; Umam et al., 2023).

Nevertheless, the association was weak, and half of the participants had prehypertension or hypertension despite the absence of a poor-knowledge category. This pattern points to a knowledge-action gap. Knowing what should be done does not guarantee that preventive practices can be implemented consistently. Food availability, household preferences, income, social support, physical limitations, health-care access, treatment adherence, duration of hypertension, genetic susceptibility, and age-related vascular changes may all influence blood pressure independently of knowledge. The conceptual model is therefore useful when knowledge is understood as a predisposing factor that interacts with enabling and reinforcing conditions rather than as a sufficient cause.

The distribution of knowledge also deserves attention. Almost two thirds of participants were categorized as having adequate rather than good knowledge. They may have understood general messages, such as reducing salt or remaining active, without having detailed knowledge of sodium sources, appropriate exercise intensity, medication adherence, or the need for routine monitoring in the absence of symptoms. Health education should therefore move beyond one-way delivery of general information. Practical demonstrations, food-label reading, low-cost meal planning, individual goal setting, family involvement, and repeated

feedback from blood pressure monitoring may help convert knowledge into sustained behavior.

The results nevertheless have a limited public-health implication for community health promotion: self-reported preventive practices may be worth assessing alongside objective blood-pressure measurements. However, the present study did not evaluate a health-education intervention and did not measure whether changing preventive practice changes blood pressure. Future programs may therefore consider repeated education, family involvement, practical dietary counseling, physical-activity support, medication counseling, and regular monitoring, but their effectiveness should be tested prospectively rather than inferred from the present association.

This study adds local evidence by linking a prevention-knowledge category with an objectively recorded blood pressure category in a community sample of older adults. The result can inform community health promotion in Sekargadung, where health workers can combine age-appropriate education with regular screening and follow-up. However, because the study was cross-sectional, the observed association cannot establish that better knowledge produced better blood pressure status. It is also possible that participants with normal or previously detected blood pressure problems had more contact with health services and consequently acquired more knowledge.

Finally, the small sample and sparse highest MAP category reduce the stability of the correlation estimate. The finding should be viewed as preliminary local evidence that warrants confirmation in larger samples using validated practice or knowledge instruments, standardized repeated blood-pressure measurements, and multivariable analysis.

CONCLUSION

Among older adults in Sekargadung, a higher self-reported hypertension-prevention practice category was statistically associated with a more favorable study-defined MAP category (rho = 0.383, p = 0.037). The association was weak. Because the study was cross-sectional, used a small purposive sample, relied on a study-specific practice questionnaire, used nonstandard MAP categories, and did not adjust for important confounders, the finding should be interpreted as an observed association rather than evidence of causality or clinical diagnostic validity.

SUGGESTION

Primary health-care and community health workers may consider routinely assessing practical hypertension-prevention behaviors together with standardized blood-pressure monitoring. Any structured education, family support, dietary counseling, or lifestyle program should be evaluated prospectively before effectiveness is inferred. Future research should recruit larger and preferably probabilistic or multisite samples, use a validated knowledge or practice instrument with transparent psychometric evidence, collect repeated standardized blood-pressure measurements, retain continuous SBP and DBP values, and adjust for major confounders such as medication use, duration of hypertension, body mass index, diet, physical activity, smoking, comorbidity, and health-service contact.

LIMITATIONS

First, the cross-sectional design does not establish temporal sequence or causality. Second, the purposive sample included 30 participants from an accessible population of 43 older adults in one urban village, limiting representativeness and external validity; the reasons why 13 individuals were not included were not documented in the available study record. Third, the questionnaire was originally labeled as a knowledge instrument but used frequency-based response options and therefore is more appropriately interpreted as self-reported preventive practice. Its item-level validity coefficients, reliability statistic, expert-validation process, and testing sample were not available for this revision. Fourth, the practice cut-offs were study-specific and were not established as universally validated thresholds.

Fifth, blood pressure was assessed during a single study encounter, and the available record does not document device manufacturer/model, calibration, number and timing of repeated readings, or arm used. Sixth, the outcome categories were based on study-specific MAP thresholds rather than standard SBP/DBP diagnostic classifications. Seventh, the analysis used categorized ordinal variables and did not exploit continuous questionnaire or SBP/DBP values; raw participant-level values were not available for reanalysis. Eighth, potential confounding by medication use, duration of hypertension, diet, body mass index, smoking, physical activity, comorbidity, family history, stress, and health-service utilization was not addressed. Finally, one MAP category contained only one participant, which further limits the stability and precision of the correlation estimate.

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