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Knowledge and Stroke Prevention Behaviors Among Hypertensive Patients in Rural Primary Care: A Health Belief Model–Informed Study

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Abstract

Background: Stroke continues to be a leading cause of mortality and long-term disability, especially in low- and middle-income countries where hypertension is both highly prevalent and frequently inadequately managed. Behavioral modification is essential for reducing stroke risk; however, the association between knowledge and preventive practices in rural primary care settings has not been sufficiently examined within a theoretical framework. This study analyzed the relationship between knowledge of stroke risk factors and stroke prevention behaviors among hypertensive patients at a rural Indonesian primary healthcare center, utilizing the Health Belief Model.

Methods: A community-based cross-sectional study was conducted with 120 hypertensive patients participating in a chronic disease management program. Knowledge and preventive behaviors were measured using structured questionnaires adapted from validated instruments with established reliability. Data analysis employed Spearman's rank correlation and partial correlation, controlling for age and education.

Results: Results demonstrated a significant positive association between knowledge and stroke prevention behaviors ($r = 0.710$, $p = 0.001$), indicating a strong correlation. After adjustment, the association remained significant ($r = 0.648$, $p = 0.004$), reflecting a moderate-to-strong relationship.

Conclusion: These results indicate that enhancing theory-informed educational strategies in primary care may improve stroke prevention efforts among hypertensive patients in rural areas.

Keywords: Hypertension, Health Belief Model, Knowledge

BACKGROUND

Stroke remains one of the leading causes of mortality and long-term disability worldwide, disproportionately affecting populations in low- and middle-income countries (LMICs). Hypertension is the most significant modifiable risk factor for both ischemic and hemorrhagic stroke, accounting for a substantial proportion of preventable cerebrovascular events (1–3). Despite advances in pharmacological treatment, poor blood pressure control and inadequate lifestyle modification continue to contribute to the growing stroke burden in rural and resource-limited settings (4–7).

Indonesia, as one of the largest LMICs in the Asia-Pacific region, faces a dual challenge of rising non-communicable diseases and uneven access to preventive health services (8,9). Primary care facilities (Puskesmas) play a crucial role in managing chronic diseases through community-based programs such as the chronic disease management program (Prolanis). However, prevention efforts often focus primarily on clinical monitoring and medication adherence, while behavioral determinants of stroke prevention receive limited structured assessment (10–14).

Behavioral modification, including blood pressure control, dietary regulation, physical activity, and lifestyle adjustments, is essential for reducing stroke risk among hypertensive patients (15–20). Nevertheless, adopting and sustaining these preventive behaviors depend not only on access to healthcare services but also on patients' knowledge, perceptions, and beliefs regarding disease severity, susceptibility, and the benefits of preventive actions.

The Health Belief Model (HBM) provides a widely recognized theoretical framework for understanding health-related behaviors (21). According to the HBM, individuals are more likely to engage in preventive actions when they perceive themselves as susceptible to a serious condition, recognize its potential consequences, and believe that the benefits of action outweigh perceived barriers (22,23). In this study, the Health Belief Model is used as a guiding conceptual framework rather than being fully tested. Knowledge of stroke risk factors is conceptualized as a cognitive component that may shape individuals' perceptions of susceptibility and severity, thereby influencing motivation to engage in preventive behaviors. Other HBM constructs, such as perceived barriers, perceived benefits, and self-efficacy, were not directly measured and remain important areas for future research. Within this framework, knowledge serves as an important cognitive foundation that shapes risk perception and supports behavioral intention. In the context of hypertension and stroke prevention, understanding how knowledge translates into preventive practices is essential for designing effective interventions in primary care settings (24–27).

Although several studies in Indonesia have examined the relationship between knowledge and stroke prevention behaviors among hypertensive patients, most have relied on descriptive or simple correlational designs without integrating behavioral theory, limiting their ability to explain how knowledge translates into preventive action. Additionally, few studies have examined these relationships within rural primary care settings where sociocultural and access-related factors may shape behavior differently (28). In addition, evidence from rural primary care settings remains limited, and educational level, sociocultural factors, and access to health information may influence behavioral outcomes differently than in urban populations. Consequently, there is a need for theoretically informed, community-based research that explores how knowledge is associated with preventive behaviors in resource-limited contexts.

This study addresses this gap by examining the association between knowledge of stroke risk factors and stroke prevention behaviors among hypertensive patients in a rural Indonesian primary care setting, informed by the Health Belief Model. By situating the analysis within a behavioral framework and focusing on a community-based chronic disease management program, this study provides context-specific evidence to inform nursing education strategies and preventive interventions in primary care systems.

Therefore, this study aims to analyze the relationship between knowledge of stroke risk factors and stroke prevention behaviors among hypertensive patients in rural primary care, using a Health Belief Model-informed approach.

METHODS

Study Design

A community-based cross-sectional design was employed, guided by the Health Belief Model (HBM). The HBM suggests that health-related behaviors are influenced by individuals' perceptions of susceptibility, severity, benefits, and barriers, with knowledge serving as a foundational cognitive component shaping health beliefs and preventive actions. In this context, knowledge of stroke risk factors was conceptualized as a cognitive determinant potentially influencing stroke prevention behaviors among hypertensive patients in a primary care setting.

Setting and Participants

The research was conducted in a rural primary healthcare center in Kebumen Regency, Central Java, Indonesia. This health center implements the chronic disease management program (Prolanis), which monitors and manages patients with hypertension and other non-communicable diseases at the community level. The rural setting represents a resource-limited primary care environment where health education and behavioral modification strategies are central to chronic disease prevention.

The study population comprised hypertensive patients registered and actively participating in the Prolanis program during the data collection period from October to December 2025. A total sampling approach was used, including all eligible patients who met the inclusion criteria, yielding a final sample of 120 participants. This method was selected to capture the entire population of registered patients within the program and to enhance the representativeness of the findings.

Participants were included if they had a documented diagnosis of hypertension, were enrolled in the Prolanis program, could communicate effectively, and provided informed consent. Individuals were excluded if they had a prior history of ischemic or hemorrhagic stroke, experienced cognitive impairment that limited their ability to complete the questionnaire, or were absent during the data collection period. A total sampling approach was used, including all eligible hypertensive patients enrolled in the program during the study period.

Variables and Measurements

Guided by the Health Belief Model (HBM), the conceptualization of knowledge as a cognitive determinant influencing preventive health behavior. Within this framework, knowledge of stroke risk factors is considered an essential precursor that shapes perceptions and motivates preventive actions. Knowledge was assessed using a 15-item structured questionnaire in true/false format, measuring understanding of the definition, classification, complications, and the relationship between hypertension and stroke. Each correct response was scored as 1, and incorrect responses as 0. Total scores were converted to percentages and categorized as good (75–100%), moderate (60–74%), or poor (<60%). Used a 10-item dichotomous (yes/no) questionnaire assessing lifestyle and self-care practices to reduce stroke risk. These behaviors included blood pressure monitoring, dietary regulation, reduced salt intake, physical activity, reduced or cessation of smoking, alcohol avoidance, stress management, and adequate rest. Preventive behaviors were categorized using the same percentage thresholds. The questionnaires were adapted from previously validated instruments used in similar community-based studies. Content validity was reviewed by experts in nursing and public health to ensure relevance and clarity. Internal consistency reliability was assessed in this study, with Cronbach's alpha values exceeding 0.70, indicating acceptable reliability.

Data Collection

Data collection was conducted during routine Prolanis activities at the health center. Eligible participants were approached and provided with detailed information regarding the study objectives, procedures, voluntary participation, and confidentiality measures. Written informed consent was obtained prior to questionnaire administration. Participants completed the questionnaires on-site under the researcher's supervision to ensure comprehension of items and to minimize missing responses. All responses were anonymized using coded identifiers to protect participant confidentiality.

Data Analysis

Data were analyzed using SPSS version 31. Descriptive statistics were used to summarize participants' sociodemographic characteristics, knowledge levels, and categories of stroke prevention behaviors. Given the ordinal nature of the categorized variables and the non-normal distribution of the data, Spearman's rank correlation was used to examine the association between knowledge of stroke risk factors and stroke prevention behaviors. Statistical significance was established at $p < 0.05$.

In addition to bivariate Spearman's rank correlation, partial correlation analysis was conducted to examine the association between knowledge and stroke prevention behaviors while controlling for potential confounding variables, including age and educational level. This analysis was performed to strengthen the robustness of the findings and account for sociodemographic influences.

Ethical Considerations

This study was reviewed and granted ethical exemption by the Health Research Ethics Committee. The study received an official Ethical Exemption Certificate under Protocol No. 11113001623 and Reference No. 256.6/II.3.AU/F/KEPK/IX/2025. The study was deemed ethically appropriate in accordance with the WHO 2011 Standards and the 2016 CIOMS Guidelines, and it fulfilled the principles of social value, scientific validity, equitable assessment of risks and benefits, confidentiality and privacy protection, and informed consent. Participation was entirely voluntary. All participants received a clear explanation of the study and signed written informed consent forms prior to participation. Confidentiality was maintained by assigning coded identifiers, and no personally identifiable information was disclosed. Participants were informed of their right to withdraw from the study at any time without consequence.

RESULT AND DISCUSSION

Respondent Characteristics

A total of 120 hypertensive patients participated in this study. The majority were female (76.7%) and aged 46-65 years. Most participants had completed primary education, and a substantial proportion were engaged in farming or household-related occupations, reflecting the rural socioeconomic context of the study setting.

Table 1. Sociodemographic Characteristics of Participants (n = 120)

Characteristic	n	%
Age (years)		
36–45	12	10.0
46–55	50	41.7
56–65	34	28.3
>65	24	20.0

Gender		
Male	28	23.3
Female	92	76.7
Education Level		
Primary School	52	43.3
Junior High School	36	30.0
Senior High School	24	20.0
Higher Education	8	6.7
Occupation		
Farmer	56	46.7
Housewife	52	43.3
Laborer	12	10.0

Most participants demonstrated good knowledge of stroke risk factors (76.7%), while the remainder had moderate knowledge. Regarding preventive practices, 66.7% reported good stroke prevention behaviors, whereas a smaller proportion demonstrated moderate or low levels of preventive engagement.

Table 2 . Distribution of Knowledge of Stroke Risk Factors and Stroke Prevention Behaviors (n = 120)

Variable	Category	n	%
Knowledge of Stroke Risk Factors	Good	92	76.7
	Moderate	28	23.3
	Poor	0	0
Stroke Prevention Behaviors	Good	80	66.7
	Moderate	16	13.3
	Poor	24	20.0

Spearman's rank correlation analysis revealed a statistically significant positive association between knowledge of stroke risk factors and engagement in stroke prevention behaviors ($r = 0.710$, $p = 0.001$), indicating a strong positive correlation. Higher levels of knowledge were associated with greater participation in preventive practices. After adjusting for age and educational level using partial correlation analysis, the association remained statistically significant, though slightly reduced ($r = 0.648$, $p = 0.004$), reflecting a moderate-to-strong correlation. The persistence of this relationship after adjustment indicates that knowledge influences preventive behavior independently of key sociodemographic variables. These results underscore the importance of knowledge as a determinant of preventive health behavior in primary care contexts.

Table 3. Correlation Between Knowledge of Stroke Risk Factors and Stroke Prevention Behaviors

Analysis	Correlation Coefficient (r)	p-value
Spearman's rank correlation	0.710	0.001
Partial correlation (adjusted for age and education)	0.648	0.004

The association between knowledge of stroke risk factors and stroke prevention behaviors among hypertensive patients in a rural primary care setting was examined using the Health Belief Model as a guiding framework. The results demonstrate a strong and statistically significant positive relationship between knowledge and preventive behaviors. Notably, this association persisted after adjusting for age and educational level, indicating that knowledge is independently associated with preventive practices beyond basic sociodemographic factors.

Within the Health Belief Model framework, knowledge serves as a cognitive foundation that shapes individuals' perceptions of susceptibility and severity, thereby supporting motivation to engage in preventive behaviors. However, knowledge alone does not fully account for behavioral engagement. Additional constructs, including perceived barriers, perceived benefits, and self-efficacy, are also likely to influence individuals' ability and willingness to adopt and maintain preventive practices.

DISCUSSION

The Role of Knowledge as a Cognitive Foundation for Preventive Behavior

Within the Health Belief Model, knowledge functions as a cognitive foundation that shapes risk perception and facilitates behavioral decision-making. Individuals who comprehend the consequences of uncontrolled hypertension, including the risk of stroke, are more likely to regard the condition as both serious and personally relevant. This heightened perception can enhance motivation to adopt protective behaviors, such as dietary modification, regular physical activity, and blood pressure monitoring (29–31).

The strong correlation observed in this study ($r = 0.710$) indicates that knowledge is not solely an informational attribute but is closely linked to patients' behavioral orientation toward self-care. After adjusting for age and education (partial $r \approx 0.65$), the association remained substantial. These results support the conclusion that enhancing knowledge may directly facilitate behavioral engagement, particularly within structured community-based programs such as Prolanis (32,33).

Previous studies conducted in Indonesia and other low- and middle-income countries (LMIC) contexts have reported similar associations between knowledge and preventive behaviors among hypertensive populations (34). However, many of these investigations were descriptive and lacked a theoretical framework. By situating the analysis within the Health Belief Model, the present study offers a conceptual explanation for the mechanisms through which knowledge may influence behavior, rather than merely reporting statistical associations.

Context of Rural Primary Care

The rural setting of this study adds an important contextual dimension. Participants largely had primary-level education and were engaged in farming or household work. In such environments, access to specialized health information may be limited, and preventive behaviors may depend heavily on primary care–based health education. Despite these structural limitations, a substantial proportion of participants demonstrated good knowledge and reported good preventive practices. This may reflect the impact of ongoing chronic disease management programs in primary care. It also suggests that community-based education delivered through routine services can meaningfully influence patient behavior (35,36).

However, the presence of participants with moderate or poor preventive behavior indicates that knowledge alone may not be sufficient for all individuals. According to the Health Belief Model, behavior is shaped not only by knowledge but also by perceived barriers, perceived benefits, and self-efficacy (37). These constructs were not directly measured in the present study, highlighting an area for further investigation.

Implications for Nursing and Primary Care Practice

The findings carry practical implications for nursing practice in primary care settings. First, structured and theory-informed health education should remain central to hypertension management programs. Education should not only convey information but also strengthen patients' perception of susceptibility and severity while addressing perceived barriers to behavior change.

Second, nurses working in rural primary care should consider tailoring educational strategies to patients' sociocultural backgrounds and literacy levels. Visual aids, interactive discussions, and family involvement may enhance comprehension and reinforce behavior change. Third, integrating behavioral theory into community programs may improve program effectiveness. Rather than delivering general health messages, interventions informed by the Health Belief Model can target specific determinants of behavior, potentially producing more sustainable preventive outcomes.

Contribution and Research Gap

This study contributes to the literature in several ways. It provides theory-informed evidence from a rural Indonesian primary care setting, a context that remains underrepresented in global health behavior research. It also demonstrates that the association between knowledge and preventive behavior persists even after controlling for basic sociodemographic characteristics. Nonetheless, several research gaps remain. The cross-sectional design limits causal interpretation; it cannot be determined whether higher knowledge leads to better behavior or whether individuals who are already behaviorally engaged seek more information. Longitudinal or interventional studies are needed to clarify directionality.

Furthermore, the Health Belief Model includes additional constructs such as perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy. Future studies should incorporate these variables to examine a more comprehensive behavioral pathway. Finally, the relatively small sample size restricts generalizability. Larger multi-site studies across rural and urban settings would help determine whether the observed association holds in broader populations.

This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between knowledge and stroke-prevention behaviors. Second, reliance on self-reported data may introduce recall and social desirability biases, potentially resulting in overestimation of preventive behaviors. Third, although age and educational level were controlled for, other potential confounders, such as socioeconomic status, health literacy, and access to healthcare, were not measured and may have influenced the results. Finally, although knowledge was significantly associated with preventive practices, it may not be sufficient to ensure sustained behavior change, as other determinants such as perceived barriers, self-efficacy, and environmental factors were not assessed.

CONCLUSION

This study highlights the central role of knowledge in shaping stroke prevention behaviors among hypertensive patients in a rural primary care setting. Informed by the Health Belief Model, the findings suggest that cognitive understanding of stroke risk is closely linked to patients' engagement in preventive practices, independent of age and educational background. In resource-limited primary care settings, strengthening patients' knowledge through structured, theory-informed education may be a practical, scalable strategy to reduce stroke risk. However, knowledge alone may not fully explain behavioral engagement, underscoring the need for future research that incorporates broader behavioral constructs and longitudinal designs to better understand sustained preventive action.

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AUTHOR'S CONTRIBUTION STATEMENT

BW: Conceptualization, Writing – Original Draft, Review & Editing. RF: Data collection, Formal analysis, Writing – Original Draft. PAWS: Conceptualization, Methodology, Supervision, Manuscript review & editing.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest in the writing of this article.

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

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