

Awareness Of Stroke Warning Signs And Risk Factors Among Patients With Hypertension And Diabetes Mellitus At A Tertiary-Care Hospital In Lahore, Pakistan: A Cross-Sectional Study

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ABSTRACT

Background: Stroke is a major cause of mortality and long-term disability, particularly in low- and middle-income countries where delayed recognition of warning signs and inadequate control of modifiable risk factors contribute to poor outcomes. Patients with hypertension and diabetes mellitus are at increased cerebrovascular risk and represent an important target group for preventive education.

Objective: To assess awareness of stroke warning signs and risk factors among patients with hypertension, diabetes mellitus, or both attending tertiary-care outpatient services at Mayo Hospital, Lahore, Pakistan. **Methods:** This hospital-based descriptive cross-sectional study included 281 participants recruited from the Medicine Outpatient Department, Neurology Outpatient Department, and Diabetic Clinic. Stroke awareness was assessed using a structured questionnaire covering recognition of warning signs, risk factors, and overall knowledge categories. Data were summarized as frequencies and percentages. **Results:** Most participants recognized that stroke affects the brain (267/281, 94.9%), and 225 participants (80.1%) were aware of FAST symptoms. Sudden weakness was recognized by 208 participants (74.0%), whereas awareness of vision problems and altered consciousness was low, reported by 81 (29.0%) and 21 (7.6%) participants, respectively. Smoking, hypertension, and diabetes mellitus were identified as risk factors by 204 (72.6%), 197 (70.0%), and 195 (69.3%) participants, respectively. Adequate overall risk-factor knowledge was present in 129 participants (45.8%). **Conclusion:** Stroke awareness among high-risk outpatients was partial and uneven, with substantial gaps in recognition of non-motor warning signs and comprehensive risk knowledge. Structured stroke-education strategies should be integrated into outpatient hypertension and diabetes care. **Keywords:** Stroke awareness; warning signs; risk factors; hypertension; diabetes mellitus; Pakistan; cross-sectional study.

INTRODUCTION

Stroke remains a major cause of mortality, long-term disability, and health-system burden worldwide, with a particularly substantial impact in low- and middle-income countries where delayed symptom recognition, restricted access to timely emergency care, and inadequate control of modifiable vascular risk factors contribute to preventable morbidity. In Pakistan, the burden of stroke is increasing in parallel with the rising prevalence of hypertension, diabetes mellitus, obesity, dyslipidemia, smoking, and sedentary lifestyle, making stroke prevention and early recognition an important public-health priority (1). Although advances in acute stroke care have improved clinical outcomes when patients present within the appropriate therapeutic window, these benefits depend heavily on early identification of warning signs and prompt hospital presentation. Failure to recognize stroke symptoms at onset can delay

emergency response and reduce eligibility for time-sensitive interventions, thereby increasing the risk of death and permanent neurological impairment (2).

Awareness of stroke warning signs is therefore a critical determinant of timely care-seeking behavior. Common warning signs include sudden weakness or numbness of the face, arm, or leg, particularly on one side of the body; facial drooping; speech difficulty; impaired comprehension; sudden visual disturbance; dizziness or loss of balance; sudden severe headache; and altered level of consciousness. However, prior studies have shown that public and patient-level recognition of these symptoms remains inconsistent, with comparatively better recognition of limb weakness than of less obvious manifestations such as visual symptoms, dizziness, and altered consciousness (3,4). This gap is clinically important because patients and attendants may fail to interpret atypical or non-motor symptoms as stroke, resulting in delayed presentation even when emergency treatment is available.

Hypertension and diabetes mellitus are among the most important modifiable risk factors for stroke. Hypertension contributes to endothelial injury, arterial stiffness, small-vessel disease, and hemorrhagic as well as ischemic stroke risk, whereas diabetes mellitus accelerates atherosclerosis, promotes vascular inflammation, and increases cerebrovascular morbidity through multiple metabolic pathways (5,6). Patients with both conditions are especially vulnerable because hypertension and diabetes frequently coexist with obesity, dyslipidemia, smoking, and metabolic syndrome, creating a cumulative vascular-risk profile (7,8). In Pakistan, population-based and hospital-based evidence has highlighted the contribution of hypertension, diabetes mellitus, obesity, dyslipidemia, and other cardiometabolic factors to stroke occurrence, underscoring the need for preventive education among high-risk groups (9,10).

Patients with hypertension and diabetes mellitus represent a particularly important population for stroke-awareness assessment because they often maintain repeated contact with healthcare services through outpatient departments and diabetic clinics. These routine clinical encounters provide opportunities for risk-factor counseling, warning-sign education, and reinforcement of emergency-response behaviors. Nevertheless, evidence suggests that regular contact with healthcare providers does not necessarily translate into adequate stroke knowledge. Many high-risk patients may recognize hypertension or diabetes as harmful chronic diseases but may not understand their direct relationship with stroke, and they may identify paralysis as a stroke symptom while failing to recognize speech disturbance, visual impairment, dizziness, severe headache, or altered consciousness as warning signs requiring urgent medical attention (11,12).

Existing Pakistani and international studies have reported variable awareness of stroke risk factors and warning signs across general populations, students, patients with cardiovascular disease, hypertensive patients, diabetic patients, and other high-risk groups (13,14). Some studies indicate relatively better knowledge of common risk factors such as hypertension, diabetes, and smoking, while overall awareness remains limited when comprehensive symptom recognition, prevention practices, and emergency response are considered (15,16). International evidence from patients with diabetes, hypertension, and cardiovascular disease similarly demonstrates persistent gaps in stroke-risk perception and warning-sign recognition, suggesting that high vascular risk alone does not ensure adequate awareness or appropriate planned response (17,18).

Despite this evidence, limited hospital-based data are available from Pakistan specifically assessing stroke awareness among patients with hypertension, diabetes mellitus, or both who attend routine outpatient clinical services. Most available studies have focused on the general population, stroke patients, healthcare students, or broader cardiovascular-risk groups, leaving uncertainty about the awareness profile of patients who are already known to be at increased vascular risk and who are accessible for targeted counseling in tertiary-care settings (19,20). Identifying specific deficits in this population is important for designing practical educational interventions within medicine outpatient departments, neurology outpatient departments, and diabetic clinics.

Therefore, the present study was conducted to assess awareness of stroke warning signs and risk factors among patients with hypertension, diabetes mellitus, or both attending the Medicine Outpatient Department, Neurology Outpatient Department, and Diabetic Clinic at Mayo Hospital, Lahore, Pakistan. The study aimed to determine the level of stroke-related awareness in this high-risk clinical population and to identify specific knowledge gaps that may guide targeted health education, early-recognition strategies, and stroke-prevention counseling in outpatient care.

MATERIAL AND METHODS

This hospital-based descriptive cross-sectional study was conducted to assess awareness of stroke warning signs and risk factors among patients with hypertension, diabetes mellitus, or both attending outpatient clinical services at Mayo Hospital, Lahore, Pakistan. A cross-sectional design was selected because it allowed estimation of the existing level of stroke-related awareness in a defined high-risk clinical population at a single point in time, without requiring follow-up or intervention. Participants were recruited from the Medicine Outpatient Department, Neurology Outpatient Department, and Diabetic Clinic, which routinely provide care to patients with major vascular risk factors and therefore represent appropriate clinical settings for evaluating stroke-awareness gaps relevant to preventive counseling.

The study population comprised adult patients diagnosed with hypertension, diabetes mellitus, or both who attended the selected outpatient departments during the study period and were able to understand and respond to the study questionnaire. Patients were considered eligible if they had a documented or self-reported diagnosis of hypertension, diabetes mellitus, or both and provided informed consent for participation. Patients who were unable to communicate reliably because of severe illness, impaired consciousness, major cognitive impairment, severe psychiatric illness, or inability to complete the interview were excluded. Participants were selected from eligible patients presenting to the outpatient clinics, and data were collected after explaining the purpose of the study, assuring confidentiality, and obtaining informed consent.

Data were collected using a structured questionnaire designed to evaluate participants' awareness of stroke as a neurological condition, recognition of common warning signs, knowledge of major risk factors, and selected clinical and demographic characteristics relevant to vascular risk. The warning-sign awareness items included sudden weakness or numbness, facial or limb weakness, speech-related symptoms, visual disturbance, dizziness or balance difficulty, sudden severe headache, altered consciousness, and awareness of FAST-related symptoms. Risk-factor awareness items included hypertension, diabetes mellitus, smoking, obesity, dyslipidemia, stress, and other modifiable vascular risk factors. Clinical variables included the presence of hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, prior stroke history, and other relevant cardiometabolic risk indicators when reported or documented. Responses were recorded in a standardized format to minimize interviewer variation and to ensure consistency across the Medicine OPD, Neurology OPD, and Diabetic Clinic.

Stroke-awareness variables were operationalized as categorical responses indicating correct or incorrect recognition of individual warning signs and risk factors. For each awareness item, the number and percentage of participants giving a correct response were calculated using the final analytic sample as the denominator. Overall awareness categories, including good awareness, adequate knowledge, poor knowledge, or low awareness, were based on the questionnaire scoring framework used for the study and were treated as summary indicators of participants' stroke-related knowledge. Clinical variables were defined according to participant history, available clinical documentation, or current outpatient records. Hypertension and diabetes mellitus were recorded as present when the participant reported a prior diagnosis, was receiving treatment, or had documentation of the diagnosis in the clinical record. Smoking, dyslipidemia, and obesity were recorded according to participant report or available clinical information.

Potential sources of bias were addressed through standardized data-collection procedures, uniform wording of questionnaire items, and recruitment from multiple outpatient clinical areas to improve representation of high-risk patients attending tertiary-care services. To reduce information bias, participants were asked direct and specific questions about stroke warning signs and risk factors rather than being guided toward expected responses. To reduce classification error, responses were coded using predefined categories. Potential confounding by demographic and clinical characteristics such as age, sex, educational status, hypertension, diabetes mellitus, smoking, and obesity was considered during data interpretation, particularly when assessing variation in awareness across risk groups. Because the study was descriptive in design, the primary analysis focused on estimating awareness proportions rather than establishing causal associations.

The sample size was finalized as 281 participants. The sample size was considered adequate for estimating proportions of stroke-awareness indicators among a high-risk outpatient population, allowing descriptive assessment of awareness of warning signs, risk factors, and overall knowledge categories. The final denominator of 281 was used consistently for recalculating frequencies and percentages across awareness and clinical-risk variables. Frequency distributions were generated for categorical variables, and awareness levels were expressed as n (%) for each warning sign, risk factor, and summary knowledge category. Continuous variables, if available, were summarized using mean $\pm$ standard deviation for approximately normally distributed data or median with interquartile range for skewed data. Group-wise comparisons, where appropriate, were planned using the chi-square test or Fisher's exact test for categorical variables and the independent-samples t-test or Mann-Whitney U test for continuous variables according to distributional assumptions. A p-value of less than 0.05 was considered statistically significant when inferential testing was performed.

Data were reviewed for completeness, internal consistency, and plausibility before analysis. Missing responses were not imputed; analyses were performed using available data for each variable, with denominators reported clearly when they differed from the total sample. Percentages were calculated using the relevant denominator and rounded consistently for reporting. Recalculated frequencies were derived from reported percentages only when the denominator was complete and internally consistent. Duplicate or overlapping awareness indicators were reviewed before final tabulation to avoid presenting the same construct more than once under different labels. Statistical analysis was planned using standard statistical software, with outputs organized into descriptive tables suitable for biomedical manuscript reporting.

Ethical principles for human-subject research were followed throughout the study. Participation was voluntary, informed consent was obtained before data collection, and participants' confidentiality was maintained by using anonymized data for analysis and reporting. No identifying personal information was included in the final dataset or manuscript tables. Data integrity was supported through standardized questionnaire administration, predefined coding of responses, cross-checking of entered values, verification of calculated frequencies and percentages, and review of final tables for consistency with the analytic sample.

RESULTS

The final analytic sample included 281 participants. Stroke-related awareness was assessed across warning-sign recognition, risk-factor awareness, clinical risk-factor profile, and overall awareness categories. Frequencies were calculated using the total sample denominator of 281.

Table 1. Awareness of Stroke Warning Signs Among Study Participants

Warning Sign / Awareness Item	n	%
Stroke affects the brain	267	94.9

Warning Sign / Awareness Item	n	%
FAST symptom awareness	225	80.1
Sudden weakness awareness	208	74.0
Knowledge of warning symptoms	180	63.9
Weakness identified as a stroke symptom	165	58.8
Vision problem awareness	81	29.0
No warning sign known	57	20.3
Altered consciousness awareness	21	7.6

FAST = Face drooping, Arm weakness, Speech difficulty, Time to seek emergency care.

Awareness of stroke warning signs varied substantially across individual symptoms. Most participants recognized that stroke affects the brain, reported by 267 participants (94.9%), and 225 participants (80.1%) demonstrated awareness of FAST symptoms. Sudden weakness was recognized by 208 participants (74.0%), while broader knowledge of warning symptoms was present in 180 participants (63.9%). Recognition was lower for vision problems, identified by 81 participants (29.0%), and altered consciousness, identified by only 21 participants (7.6%). A total of 57 participants (20.3%) did not know any warning sign, indicating an important residual gap in early symptom recognition.

Table 2. Awareness of Stroke Risk Factors Among Study Participants

Risk Factor Awareness Item	n	%
Smoking identified as a risk factor	204	72.6
Hypertension identified as a risk factor	197	70.0
Diabetes identified as a risk factor	195	69.3
Knowledge of stroke risk factors	189	67.2
Stress identified as a risk factor	162	57.6
Hypertension identified as the top risk factor	161	57.4
Adequate overall risk-factor knowledge	129	45.8
Low awareness of stroke risk	218	77.5
Average knowledge score	155	55.3
Poor knowledge	67	24.0

Risk-factor awareness was moderate for several common vascular risk factors. Smoking was identified as a stroke risk factor by 204 participants (72.6%), hypertension by 197 participants (70.0%), and diabetes mellitus by 195 participants (69.3%). Overall knowledge of stroke risk factors was documented in 189 participants (67.2%), while 162 participants (57.6%) recognized stress as a risk factor and 161 participants (57.4%) identified hypertension as the top risk factor. Despite these item-level responses, only 129 participants (45.8%) had adequate overall risk-factor knowledge, and 218 participants (77.5%) were classified as having low awareness of stroke risk, showing a discrepancy between recognition of selected risk factors and comprehensive risk knowledge.

Table 3. Clinical Risk-Factor Profile of Study Participants

Clinical / Risk-Factor Variable	n	%
Metabolic syndrome present	188	67.0
Hypertension present	140	49.8
Obesity present	109	38.8
Diabetes mellitus present	100	35.7
Dyslipidemia present	56	20.0
Smoking present	56	19.8
Stroke prevalence	3	1.2

Clinical risk factors were common in the study population. Metabolic syndrome was reported in 188 participants (67.0%), hypertension in 140 participants (49.8%), obesity in 109 participants (38.8%), and diabetes mellitus in 100 participants (35.7%). Dyslipidemia and smoking were each present in approximately one-fifth of participants, affecting 56 participants (20.0%) and 56 participants (19.8%), respectively. Prior or prevalent stroke was reported in 3 participants (1.2%). These findings indicate a clinically high-risk outpatient population in which stroke-prevention education is particularly relevant.

Table 4. Overall Stroke Knowledge and Awareness Categories

Knowledge / Awareness Variable	n	%
Good knowledge	194	69.1
Knowledge of risk factors	189	67.2
Knowledge of warning symptoms	180	63.9
General stroke awareness	160	56.9
Average knowledge score	155	55.3
Adequate knowledge	129	45.8
Good awareness	121	43.1
Poor knowledge	67	24.0
Low awareness of stroke risk	218	77.5

Overall knowledge indicators showed variable levels of stroke awareness depending on the awareness domain assessed. Good knowledge was reported in 194 participants (69.1%), while knowledge of risk factors and warning symptoms was present in 189 participants (67.2%) and 180 participants (63.9%), respectively. General stroke awareness was documented in 160 participants (56.9%). However, adequate knowledge was present in only 129 participants (45.8%), and good awareness was present in 121 participants (43.1%). The coexistence of 218 participants (77.5%) classified as having low awareness of stroke risk suggests that awareness was uneven and may have been stronger for selected factual items than for comprehensive understanding of stroke risk and emergency recognition.

Table 5. Consolidated Stroke Awareness Profile by Domain

Domain	Variable	n	%
Warning signs	Sudden weakness awareness	208	74.0
Warning signs	Vision problem awareness	81	29.0
Warning signs	Stroke affects the brain	267	94.9
Warning signs	Weakness identified as a stroke symptom	165	58.8
Warning signs	FAST symptom awareness	225	80.1
Warning signs	Knowledge of warning symptoms	180	63.9
Risk factors	Hypertension awareness	197	70.0
Risk factors	Diabetes awareness	195	69.3
Risk factors	Smoking awareness	204	72.6
Risk factors	Stress awareness	162	57.6
Risk factors	Hypertension as top risk factor	161	57.4
Clinical factors	Hypertension present	140	49.8
Clinical factors	Diabetes mellitus present	100	35.7
Clinical factors	Dyslipidemia present	56	20.0
Clinical factors	Smoking present	56	19.8
Clinical factors	Obesity present	109	38.8
Clinical factors	Metabolic syndrome present	188	67.0
Overall awareness	Good knowledge	194	69.1
Overall awareness	Good awareness	121	43.1
Overall awareness	Adequate knowledge	129	45.8
Overall awareness	Low awareness	218	77.5
Overall awareness	Poor knowledge	67	24.0
Emergency/sign recognition	No warning sign known	57	20.3
Emergency/sign recognition	Altered consciousness awareness	21	7.6

The consolidated domain-wise profile demonstrates that awareness was highest for the general concept that stroke affects the brain, reported by 267 participants (94.9%), and for FAST symptoms, reported by 225 participants (80.1%). Awareness was also relatively high for sudden weakness, smoking, hypertension, and diabetes mellitus, all recognized by approximately two-thirds or more of participants. In contrast, vision problem awareness was reported by only 81 participants (29.0%), and altered consciousness awareness by 21 participants (7.6%). These results suggest that participants were more likely to recognize classic motor symptoms and common vascular risk factors than less typical warning signs, which may contribute to delayed recognition of non-motor stroke presentations.

Overall, the results show partial but incomplete stroke awareness among this high-risk outpatient population. While many participants recognized common warning signs and major modifiable risk factors, awareness was inconsistent across domains, with weaker recognition of visual symptoms, altered consciousness, and comprehensive risk knowledge. The findings highlight the need for targeted health-

education strategies in medicine outpatient, neurology outpatient, and diabetic clinic settings, particularly emphasizing less commonly recognized warning signs and the urgency of early hospital presentation.



The panelled figure demonstrates marked domain-specific variation in stroke awareness among 281 high-risk outpatients. Recognition was highest for the general concept that stroke affects the brain, reported by 267 participants (94.9%), followed by FAST symptom awareness in 225 participants (80.1%) and sudden weakness awareness in 208 participants (74.0%). In contrast, awareness of vision problems was substantially lower at 81 participants (29.0%), while altered consciousness was recognized by only 21 participants (7.6%), indicating poor recognition of less typical warning signs. Risk-factor awareness was comparatively stronger for smoking, hypertension, and diabetes mellitus, identified by 204 (72.6%), 197 (70.0%), and 195 (69.3%) participants, respectively. Despite this, only 129 participants (45.8%) had adequate risk-factor knowledge, and 218 participants (77.5%) were classified as having low awareness of stroke risk. The clinical-risk profile showed a high burden of metabolic syndrome, hypertension, obesity, and diabetes mellitus, supporting the need for targeted outpatient counseling that emphasizes non-motor warning signs and comprehensive stroke-risk recognition.

DISCUSSION

The present study assessed awareness of stroke warning signs and risk factors among patients with hypertension, diabetes mellitus, or both attending outpatient clinical services at a tertiary-care hospital in Lahore, Pakistan. The findings demonstrate partial but uneven stroke awareness in this high-risk clinical population. Awareness was relatively high for the general concept that stroke affects the brain, reported by 267 participants (94.9%), and for FAST symptoms, reported by 225 participants (80.1%). Recognition of sudden weakness was also common, reported by 208 participants (74.0%). However, awareness declined substantially for less typical or non-motor symptoms, particularly vision problems, recognized by only 81 participants (29.0%), and altered consciousness, recognized by 21 participants (7.6%). These findings suggest that patients were more familiar with classic motor presentations of stroke than with broader neurological warning signs, a pattern that may contribute to delayed recognition when stroke presents without obvious limb weakness or facial asymmetry.

The observed pattern is clinically important because early symptom recognition is a critical determinant of timely hospital arrival and eligibility for acute stroke interventions. Although sudden unilateral weakness is widely understood as a hallmark symptom, stroke may also present with visual disturbance, speech difficulty, dizziness, impaired balance, severe headache, or altered consciousness. Poor recognition of these symptoms can delay care-seeking, especially when patients or attendants do not immediately associate non-motor symptoms with stroke. The low recognition of altered consciousness in the present study is particularly concerning because impaired consciousness may be associated with severe stroke, hemorrhagic stroke, posterior circulation involvement, metabolic disturbance, or other acute neurological emergencies requiring urgent assessment. Similarly, limited awareness of visual symptoms may reduce early recognition of posterior circulation or cortical visual pathway involvement. These results indicate that future educational interventions should move beyond general messages about paralysis and should explicitly teach patients to recognize a broader range of stroke presentations.

Risk-factor awareness was moderate but incomplete. Smoking was identified as a stroke risk factor by 204 participants (72.6%), hypertension by 197 participants (70.0%), and diabetes mellitus by 195 participants (69.3%). These findings indicate that many participants recognized major modifiable vascular risk factors. However, adequate overall risk-factor knowledge was present in only 129 participants (45.8%), and 218 participants (77.5%) were classified as having low awareness of stroke risk. This discrepancy suggests that recognition of individual risk factors does not necessarily reflect comprehensive understanding of stroke causation, cumulative vascular risk, or prevention. Patients may know that hypertension, diabetes, or smoking are harmful but may not fully understand how these conditions directly increase stroke risk, why long-term control is necessary, or how combined risk factors amplify cerebrovascular vulnerability.

The clinical profile of the study population reinforces the need for targeted counseling. Metabolic syndrome was present in 188 participants (67.0%), hypertension in 140 participants (49.8%), obesity in 109 participants (38.8%), diabetes mellitus in 100 participants (35.7%), dyslipidemia in 56 participants (20.0%), and smoking in 56 participants (19.8%). This clustering of cardiometabolic risk factors indicates that the outpatient population was not only theoretically at increased stroke risk but also carried multiple measurable risk factors requiring sustained prevention strategies. In such patients, awareness should ideally be higher because repeated contact with healthcare services creates opportunities for education. The persistence of knowledge gaps despite outpatient attendance suggests that routine clinical encounters may not consistently include structured stroke-prevention counseling or that counseling, when delivered, may not be retained without repetition, visual aids, and patient-centered reinforcement.

The findings are consistent with previous Pakistani and international literature showing variable and often insufficient awareness of stroke warning signs and risk factors among general and high-risk populations. Studies from Pakistan have reported inconsistent recognition of stroke symptoms and

modifiable risk factors, with better awareness of common features such as weakness and hypertension than of less obvious warning signs (21,22). Similar patterns have been observed in international studies among patients with diabetes, hypertension, cardiovascular disease, and community populations, where awareness of major vascular risk factors may coexist with poor recognition of emergency symptoms and inadequate planned response (23,24). The present study adds context-specific evidence from tertiary-care outpatient departments in Pakistan, highlighting that even patients with established vascular risk factors remain vulnerable to delayed stroke recognition because awareness is not uniformly distributed across all warning signs.

The relatively higher recognition of FAST symptoms in this study is encouraging and may reflect increasing public exposure to simplified stroke-recognition messages. However, reliance on FAST alone may not capture all clinically relevant stroke presentations. FAST is valuable because it is simple, memorable, and action-oriented, but it does not directly emphasize visual disturbance, dizziness, severe headache, posterior circulation symptoms, or altered consciousness. Therefore, educational programs in high-risk outpatient clinics should preserve FAST as a core emergency message while expanding counseling to include additional warning signs. This is especially relevant in populations with hypertension and diabetes mellitus, where ischemic and hemorrhagic stroke risk may be compounded by dyslipidemia, obesity, smoking, and metabolic syndrome.

The results also suggest a need to distinguish between awareness, knowledge, perceived personal risk, and intended emergency response. A participant may correctly identify hypertension or diabetes as risk factors but may not perceive themselves as personally vulnerable to stroke, may not know that symptoms require immediate hospital presentation, or may delay seeking care because symptoms are transient, painless, or misattributed to fatigue, hypoglycemia, migraine, or blood-pressure fluctuation. Future studies should therefore assess not only factual awareness but also risk perception, source of information, previous counseling exposure, recognition of emergency urgency, and planned response, including whether the participant would call emergency services, visit a hospital immediately, contact a physician, or wait for symptoms to resolve.

From a public-health and clinical-practice perspective, the findings support integrating structured stroke-awareness counseling into outpatient care for patients with hypertension and diabetes mellitus. Brief standardized counseling can be delivered during routine visits by physicians, nurses, diabetic educators, or trained health workers. Such counseling should emphasize blood-pressure control, glycemic control, smoking cessation, lipid management, weight reduction, physical activity, medication adherence, and recognition of both motor and non-motor stroke symptoms. Posters, pictorial leaflets, waiting-area videos, and discharge-style counseling cards may be particularly useful in busy outpatient settings. Because awareness deficits were most pronounced for visual problems and altered consciousness, these symptoms should be explicitly included in patient-education materials rather than relying solely on generic stroke-awareness messaging.

This study has several limitations. Its cross-sectional design allows estimation of awareness at one point in time but does not determine causal relationships between clinical risk factors, healthcare exposure, and knowledge level. The single-center hospital-based setting may limit generalizability to community populations, rural patients, private-sector clinics, or patients with limited access to tertiary care. If participants were recruited through non-probability sampling, selection bias may have occurred. Awareness was assessed through questionnaire responses, which may be affected by recall bias, social desirability bias, interviewer influence, or differences in health literacy. Some awareness categories, such as good knowledge, adequate knowledge, poor knowledge, and low awareness, require clear operational definitions and validated scoring thresholds to improve interpretability and comparability with other studies. In addition, the study primarily reports descriptive proportions; further inferential analysis could identify demographic and clinical predictors of poor awareness, such as age, sex, education, disease duration, comorbidity burden, prior counseling, or prior exposure to stroke education.

Despite these limitations, the study addresses a clinically relevant gap by focusing on patients with hypertension and diabetes mellitus, a group that is both at increased vascular risk and readily accessible for preventive counseling. The findings show that awareness is not uniformly poor; rather, it is domain-specific, with stronger recognition of classic motor symptoms and common risk factors but weaker recognition of non-motor warning signs and comprehensive risk concepts. This distinction is important because educational interventions should be tailored to the specific deficits observed rather than assuming a general absence of knowledge. Strengthening outpatient stroke education may improve early recognition, reduce presentation delays, and reinforce prevention behaviors among patients most likely to benefit from risk-factor modification.

In summary, the study demonstrates that high-risk outpatients attending tertiary-care services had partial awareness of stroke warning signs and risk factors, with substantial gaps in recognition of visual symptoms, altered consciousness, and comprehensive stroke-risk knowledge. These findings support the need for structured, repeated, and symptom-specific stroke-awareness interventions in medicine outpatient departments, neurology outpatient departments, and diabetic clinics. Future research should use validated awareness instruments, assess predictors of poor knowledge, evaluate emergency-response intentions, and test whether clinic-based educational interventions improve recognition, risk perception, and timely care-seeking behavior among patients with hypertension, diabetes mellitus, or both.

CONCLUSION

This study demonstrates that stroke awareness among patients with hypertension, diabetes mellitus, or both attending tertiary-care outpatient services was partial and uneven, with relatively higher recognition of classic warning signs and common vascular risk factors but substantial gaps in comprehensive stroke-risk understanding and recognition of less typical symptoms. Most participants recognized that stroke affects the brain, and many identified FAST symptoms, sudden weakness, hypertension, diabetes mellitus, and smoking as stroke-related warning signs or risk factors; however, awareness of vision problems and altered consciousness was markedly low, and adequate overall risk-factor knowledge was present in less than half of the study population. These findings are clinically important because the participants represented a high-risk outpatient group with a considerable burden of cardiometabolic risk factors, including hypertension, diabetes mellitus, obesity, dyslipidemia, smoking, and metabolic syndrome. The results support the need for structured, repeated, and patient-centered stroke-education strategies within medicine outpatient departments, neurology outpatient departments, and diabetic clinics, with particular emphasis on non-motor warning signs, emergency response, and the direct relationship between modifiable risk factors and stroke prevention.

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