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LATE PRESENTATION OF STROKE PATIENTS TO TERTIARY CARE HOSPITALS THE UNDERLYING REASONS

Original Research

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ABSTRACT

Background: Stroke is a major neurological emergency and a leading cause of morbidity and mortality worldwide. Timely hospital presentation is crucial for effective treatment, including intravenous thrombolysis and endovascular therapy, both of which significantly improve outcomes. However, delays in hospital presentation remain prevalent, especially in resource-limited settings, due to socioeconomic, logistical, and awareness-related factors. Understanding these barriers is essential for implementing effective interventions to reduce prehospital delays and improve stroke care outcomes.

Objective: To evaluate the awareness and knowledge of stroke patients and their companions presenting to a tertiary care hospital and to identify the common causes of prehospital delays.

Methods: This cross-sectional retrospective study was conducted at Sheikh Zayed Hospital, Lahore, over six months, including 200 patients with ischemic or hemorrhagic stroke who met the inclusion criteria. Data were collected on variables such as age, sex, time since last known well (LKW), education level, knowledge of stroke symptoms, availability of transportation, lifestyle (urban or rural), and history of prior treatment. Patients younger than 18 or with non-stroke neurological conditions were excluded. Data were analyzed using SPSS version 25, with descriptive and inferential statistics calculated. The Chi-square test was applied to identify statistically significant associations.

Results: The mean age of participants was 60.1 ± 18.5 years, with ischemic stroke comprising 76% (n = 152) of cases and hemorrhagic stroke 24% (n = 48). Among the cohort, 55% (n = 110) presented early (within 4 hours), while 45% (n = 90) presented late. A total of 70% (n = 140) of patients did not recognize stroke symptoms, and 75.3% (n = 151) reported lack of transportation as a barrier. Distance from the hospital affected 40.1% (n = 80) of rural patients, requiring over 45 minutes of travel. A statistically significant association was found between stroke knowledge and timing of hospital presentation (p = 0.013).

Conclusion: A considerable proportion of stroke patients presented late to the hospital due to factors such as low literacy, reliance on public transportation, misinterpretation of symptoms, and low perceived severity of their condition. Addressing these barriers through targeted educational programs and systemic healthcare improvements is critical for enhancing timely access to stroke care.

Keywords: Awareness, Delayed Diagnosis, Emergency Medical Services, Health Literacy, Ischemic Stroke, Patient Education, Stroke.

INTRODUCTION

Stroke is a significant neurological emergency associated with high rates of morbidity and mortality, presenting a pressing global health challenge. Its prevalence is rising steadily, particularly in low- and middle-income nations, where healthcare disparities exacerbate the burden of the disease. Characterized as a medical emergency, stroke requires immediate intervention within a critical window of 4.5 hours to minimize irreversible brain damage and disability. While the classical symptoms of stroke, such as sudden numbness, tingling, or faintness, are well-documented, presentations at primary healthcare facilities often include non-specific complaints such as increased sweating and general malaise. These atypical symptoms complicate the early recognition and diagnosis of stroke at the primary care level, where resources and specialized expertise are frequently limited (1,2).

In tertiary care settings, the approach to stroke management is more structured and adheres to well-established protocols. Upon a patient's arrival, stabilization of airway, breathing, and circulation (ABCs) is prioritized, followed by prehospital stroke assessments, determination of the last known well (LKW) time, and monitoring of blood glucose levels. Further evaluation includes obtaining intravenous access, ordering emergency neuroimaging such as CT or MRI scans, and performing a 12-lead ECG. The NIH Stroke Scale serves as a critical tool to assess stroke severity and guide treatment decisions. However, delays in hospital presentation often diminish these interventions' effectiveness, underscoring the critical need for timely arrival to healthcare facilities (3).

The challenge of stroke management extends beyond clinical interventions, as socio-economic and systemic barriers significantly influence patient outcomes. Timely diagnosis and treatment not only reduce the complications associated with stroke but also improve long-term prognoses. Nonetheless, preventive measures are more cost-effective and resource-efficient than addressing complications once they arise. Despite advancements in treatment modalities, such as endovascular interventions for patients presenting outside the therapeutic window, these strategies' success hinges on prompt patient presentation, a goal that remains unmet in many healthcare systems (4). For instance, studies from countries like China have highlighted prehospital delays exceeding two hours in first-time stroke patients, often attributed to inadequate awareness of early stroke symptoms and the absence of stroke management units at primary care levels (5,6).

Various socio-demographic factors exacerbate these delays. Low educational levels, rural residence, reliance on unqualified practitioners, preference for alternative medicine, low socioeconomic status, and the absence of adequate transportation contribute to late presentation. Gender disparities and the timing of symptom onset during weekdays have also been linked to delayed hospital visits (7-9). Recent trends, including increased internet usage for health-seeking behaviors and heightened disease awareness due to the COVID-19 pandemic, have somewhat improved public knowledge of stroke symptomatology. However, these improvements have not fully bridged the gaps in awareness, and the overall management of stroke patients remains suboptimal (10).

The urgency of addressing these challenges is underscored by the fact that delays in recognizing stroke symptoms or initiating timely treatment often result in preventable complications and higher mortality rates. Efforts to educate the public on recognizing core symptoms of stroke and understanding its seriousness are paramount in improving outcomes (11). Inadequate knowledge of the disease's symptoms and risk factors continues to hinder patients from seeking prompt medical attention, highlighting the critical need for targeted public health initiatives.

This study seeks to investigate the delayed health-seeking behaviors among stroke patients presenting at a tertiary care hospital, examining their awareness levels, as well as the knowledge of their attendants. By identifying and addressing the factors contributing to prehospital delays, this research aims to inform interventions that can enhance the timely and effective management of stroke patients, ensuring better outcomes with the collaboration of relevant authorities.

METHODS

A cross-sectional retrospective study design was utilized to evaluate patients meeting the inclusion criteria who presented to Sheikh Zayed Hospital, a 900-bed tertiary care facility in Rahim Yar Khan equipped with a stroke unit and a well-established thrombolysis program. The study population consisted of 200 patients diagnosed with ischemic or hemorrhagic stroke over a six-month period. Ethical

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approval was obtained from the institutional review board prior to initiating the research. All patients aged 18 years or older who presented to the hospital's emergency department, outpatient department (OPD), or wards with a confirmed diagnosis of stroke (cerebrovascular accident) were included. The time of stroke onset was defined as the moment the patient or an observer noticed the first signs and symptoms associated with the stroke.

Patients younger than 18 years of age or those presenting with multiple other emergency complaints, such as atrial fibrillation or neurological deficits of congenital or acquired origin, were excluded. All participants provided informed consent, and their data were collected using a standardized questionnaire. Variables assessed included the duration of symptoms, facilities visited prior to the hospital, history of prior treatment for stroke, availability of conveyance, lifestyle (urban or rural), knowledge of stroke symptoms, and educational status. These variables were recorded for all eligible patients presenting to the emergency department, OPD, or inpatient wards.

Data were digitized and analyzed using SPSS version 25. Continuous variables, such as age, time since last known well (LKW), first healthcare facility visited, educational status, and duration of prehospital delay, were presented as mean ± standard deviation (SD). Categorical qualitative variables, such as stroke awareness and conveyance availability, were analyzed for frequency and percentages. Associations between variables were assessed using Chi-square tests, and p-values were calculated to determine the statistical significance of these relationships.

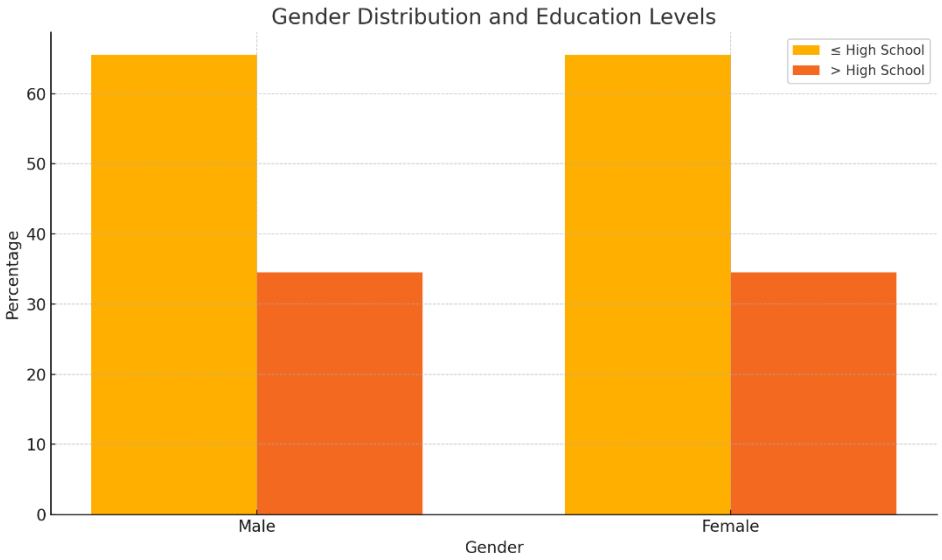
The methodology generally adhered to established standards, but certain areas warrant consideration. For instance, there was no mention of whether confounding factors, such as comorbidities (e.g., diabetes or hypertension), were controlled during analysis. Additionally, while the inclusion of both ischemic and hemorrhagic stroke cases enhances the generalizability of findings, the study does not specify whether separate analyses were conducted for these two distinct types of stroke, which could have yielded more nuanced insights. Furthermore, the exclusion of patients with multiple emergency conditions might have limited the understanding of stroke management in patients with complex presentations. Addressing these gaps in future research could strengthen the study's validity and applicability.

RESULTS

The study analyzed data from 200 patients diagnosed with stroke, including 152 with ischemic stroke and 48 with hemorrhagic stroke. The mean age of the patients was 60.1 ± 18.6 years, with 120 males (60%) and 80 females (40%). A significant proportion of patients (58.5%) were married, and the majority (65.5%) had education levels less than or equal to high school, while only 34.5% had higher education. Of the total, 110 patients (55%) presented to the hospital within 4 hours of symptom onset, while 90 patients (45%) presented later. Acute stroke symptoms included motor weakness (78.3%), swallowing difficulties (53.7%), disorientation (34.8%), altered levels of consciousness (20.7%), visual abnormalities (15.9%), and headaches (13.7%). Most patients initially sought care at the outpatient department (43.5%), followed by traditional or homeopathic medicine (15%) and nearby basic health units (16.5%).

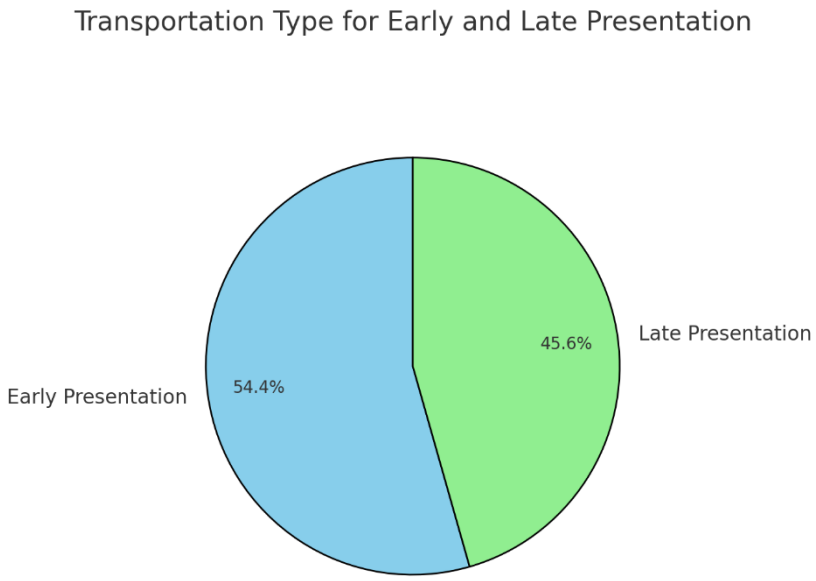
Approximately 70% of patients were unaware they were experiencing a stroke, often attributing their symptoms to fatigue, diabetes-related complications (87.7%), prior family strokes (66.6%), or hypertension (76.6%). Conveyance type significantly influenced time of presentation, with a statistically significant correlation observed between conveyance status and early hospital arrival ($p = 0.012$). A total of 96 patients who presented early (65.1%) utilized private transportation compared to 54.5% of those presenting late. Socioeconomic status also played a role, with average or above-average socioeconomic levels associated with earlier presentation ($p = 0.011$). Stroke knowledge strongly influenced arrival time, with patients demonstrating better knowledge more likely to arrive early ($p = 0.013$).

Of the total sample, 43.5% made their first contact at the hospital's outpatient department, while the remainder sought initial care from non-specialist providers, delaying definitive treatment. Reasons for delayed presentations included a lack of stroke symptom recognition (62.5%), unavailability of transportation (75.3%), reliance on alternative treatments (13%), and geographical distance from the hospital (18.4%). Importantly, a significant proportion (40.1%) of patients lived outside urban areas, requiring travel times exceeding 45 minutes. Despite these findings, no statistically significant association was observed between the timing of presentation and common stroke risk factors such as diabetes, hypertension, or a family history of stroke.



The gender distribution of the study population revealed that 60% were male (n = 120) and 40% were female (n = 80). In terms of education, the majority of patients, regardless of gender, had an educational level of less than or equal to high school (65.5%, n = 131), while 34.5% (n = 69) had attained education above high school. These findings underscore the predominance of lower educational attainment among stroke patients, which may influence their health-seeking behavior and awareness of stroke symptoms.

Figure 1 Gender Distribution and Education Levels



The analysis of transportation types revealed that among patients presenting early (within 4 hours), 65.1% (n = 96) utilized private transport, while 12.7% (n = 14) relied on public transport. In contrast, among those presenting late (after 4 hours), 54.5% (n = 78) used private transport, and 13.3% (n = 12) depended on public transport. These findings highlight the critical role of private transportation in enabling timely hospital arrival and the potential challenges posed by reliance on public transport in stroke emergencies.

Figure 2 Transportation Type for Early and Late Presentation

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Table I: Descriptive statistics of patients

Variable	N	Mean±SD / n(%)
Age	200	60.1±18.6
Marital Status		
Single	117	117 (58.5%)
Married	83	83 (41.5%)
LKW Time (Days, Hours, Minutes)		
Within 4 hrs	110	110 (55.0%)
After 4 hrs	90	90 (45.0%)
The First Facility Visited		
Self-medication	20	20 (10.0%)
Homeopathic	30	30 (15.0%)
OPD	87	87 (43.5%)
BHU	33	33 (16.5%)
Stroke specialist	30	30 (15.0%)

The descriptive statistics of the study population showed a mean age of 60.1 ± 18.6 years. Regarding marital status, 58.5% (n = 117) were single, while 41.5% (n = 83) were married. In terms of the time since the last known well (LKW), 55% (n = 110) presented to the hospital within 4 hours, whereas 45% (n = 90) presented after 4 hours. The initial healthcare facility visited varied, with 43.5% (n = 87) presenting first to the OPD, followed by 16.5% (n = 33) to a basic health unit (BHU), 15% (n = 30) to homeopathic practitioners, 15% (n = 30) to stroke specialists, and 10% (n = 20) attempting self-medication. These figures highlight significant delays and varying initial care pathways that impact timely stroke management.

Table 2: Relationship between time of presentation and risk factors

Variable	Time presentation		Test	
	Early presentation n=110 (%)	Late presentation n=90 (%)	χ^2	p
Family stroke history	78 (70.9%)	60(66.6%)	1.104	0.221
DM	98 (89.0%)	79(87.7%)	1.5	0.221
HTN	91 (82.7%)	69(76.6%)	2.6	0.101
Feeding/ swallowing	80 (72.6%)	69(76.6%)	1.4	0.201
Conveyance status			1.5	0.221
Public	96 (65.1%)	78(54.5%)		
Private	14(12.7%)	12(13.3%)		
Type of stroke			0.02	0.881
Ischemic	85 (86.3%)	67(74.4%)		
Hemorrhagic	25(22.5%)	23(25.5%)		

*DM= diabetes mellitus , *HTN=hypertension
*p<0.05 is statistically significant

The relationship between time of presentation and various risk factors revealed no statistically significant associations (p > 0.05) across the analyzed variables. Among early presenters (n = 110), 70.9% (n = 78) had a family history of stroke, compared to 66.6% (n = 60) of

late presenters (n = 90). Diabetes mellitus (DM) was present in 89% (n = 98) of early presenters and 87.7% (n = 79) of late presenters, while hypertension (HTN) was observed in 82.7% (n = 91) of early and 76.6% (n = 69) of late presenters. Feeding or swallowing difficulties were noted in 72.6% (n = 80) of early presenters and 76.6% (n = 69) of late presenters. Conveyance type and stroke type also showed no significant differences, with ischemic strokes being more common in both groups (86.3% early vs. 74.4% late). These results indicate that risk factors did not substantially influence the timing of hospital presentation.

Table 3: Relationship between time of presentation and knowledge deficits

Variable	Time presentation		Test	
	Early presentation n=110 (%)	Late presentation n=90 (%)	χ^2	p
Conveyance status			6.61	0.012*
Public	96 (65.1%)	78(54.5%)		
Private	14(12.7%)	12(13.3%)		
Socioeconomic status			6.31	0.011*
Above average	96 (65.1%)	78(54.5%)		
Average	14(12.7%)	12(13.3%)		
Below average				
Knowledge of stroke			7.745	0.013*
Good	20(18.1%)	11(12.2%)		
Average	40(36.2%)	14(15.3%)		
Poor	50(45.4%)	65(59.0%)		

*p<0.05 is statistically significant

The analysis of the relationship between time of presentation and knowledge deficits revealed statistically significant associations ($p < 0.05$) for conveyance status, socioeconomic status, and knowledge of stroke. Patients who presented early (within 4 hours) were more likely to use private transportation (65.1%, n = 96) compared to late presenters (54.5%, n = 78; p = 0.012). Socioeconomic status also influenced timing, with early presenters more commonly having average or above-average socioeconomic status (65.1%, n = 96) compared to late presenters (54.5%, n = 78; p = 0.011). Stroke knowledge was significantly associated with early presentation, with 18.1% (n = 20) of early presenters demonstrating good knowledge compared to 12.2% (n = 11) of late presenters. Conversely, poor knowledge was more prevalent among late presenters (59%, n = 65) compared to early presenters (45.4%, n = 50; p = 0.013). These findings highlight the critical role of transportation access, socioeconomic factors, and stroke awareness in influencing timely hospital arrival.

DISCUSSION

The findings of this study highlight several critical factors influencing the timing of hospital presentations among stroke patients, offering valuable insights into the barriers to timely stroke care. Despite the relatively small sample size, over half of the patients presented within the 4-hour window, which is considered optimal for initiating effective treatment such as intravenous tissue plasminogen activator (IV tPA). This early presentation rate was significantly influenced by factors such as educational attainment and socioeconomic status. Patients with higher levels of education and average or above-average socioeconomic standing were more likely to present early, suggesting an interrelationship between these variables. The association between education and timely presentation underscores the

importance of awareness and literacy in facilitating prompt health-seeking behavior. Conversely, patients with lower socioeconomic and educational levels exhibited delays, potentially linked to limited understanding of stroke symptoms and the availability of resources.

Timely hospital arrival was further associated with knowledge of stroke symptoms and the recall of emergency services numbers. These findings align with existing literature emphasizing that early recognition and awareness of stroke symptoms significantly improve functional outcomes by facilitating the initiation of time-sensitive interventions such as IV tPA within the therapeutic window (13). However, the overall utilization of IV tPA remains low globally, with only 10% to 20% of eligible patients receiving the treatment (14). This indicates a continued underutilization of critical therapies, reflecting gaps in healthcare delivery and patient education.

Interestingly, common risk factors such as hypertension, diabetes, and a family history of stroke did not show significant associations with presentation timing. This suggests that while awareness of underlying health conditions was present, it did not translate into actionable knowledge for early symptom recognition. A substantial proportion of patients delayed seeking care, attributing symptoms to fatigue, diabetes complications, or previous strokes within the family, further highlighting a significant knowledge gap. Approximately 73% of patients in previous research delayed presentation while attempting alternative treatments such as homeopathy, illustrating the pervasive influence of traditional practices and misconceptions on treatment delays (17).

The study identified several systemic barriers, including inadequate public transportation, geographical distance, and reliance on alternative medicine, which significantly contributed to delayed presentations. The underuse of ambulances and public transportation inefficiencies further compounded these delays. Additionally, the study highlighted the urban-rural divide, with rural residents facing greater delays due to extended travel times and limited access to healthcare facilities.

This study's strengths lie in its ability to provide an overview of factors influencing stroke presentation within a resource-limited setting, contributing to the limited data on this topic in Pakistan. However, the findings are constrained by the study's small sample size, single-center design, and short duration, which limit the generalizability of the results. A more robust analysis, including data from multiple centers and a larger sample size, would enhance the validity and applicability of these findings. Furthermore, the lack of data on clinical outcomes post-treatment limits the ability to draw direct correlations between early presentation and improved prognosis, which remains a critical area for future research.

A comparative study conducted in 2020 analyzed stroke presentation delays in urban versus rural settings across multiple tertiary care centers in India. The study found that rural patients experienced significantly longer prehospital delays compared to their urban counterparts due to limited access to stroke-ready facilities, lack of awareness about stroke symptoms, and inadequate transportation infrastructure. Urban patients, on the other hand, were more likely to arrive early due to better access to emergency services and higher awareness levels fostered by community health campaigns. However, even in urban areas, delays were observed due to misinterpretation of symptoms or initial visits to non-specialist care providers, underscoring the global nature of challenges in timely stroke management. The study emphasized that addressing systemic barriers such as improving transportation networks in rural areas and enhancing public education campaigns in urban settings could significantly reduce delays and improve outcomes for both populations (22).

These findings underscore the urgent need for public health initiatives to improve stroke awareness, particularly among vulnerable populations with low educational and socioeconomic statuses. Targeted educational programs, the establishment of dedicated stroke units, and better access to emergency medical services could mitigate delays and improve outcomes. Addressing these barriers through collaborative efforts involving healthcare providers, policymakers, and community stakeholders is essential for improving stroke management and reducing morbidity and mortality associated with cerebrovascular accidents.

CONCLUSION

The study concluded that a significant proportion of stroke patients continue to present late to hospitals, largely due to factors such as low socioeconomic status, limited education, reliance on public transport, initial visits to other healthcare facilities, residing in rural areas far from hospitals, and a lack of awareness regarding the severity of stroke symptoms. These findings highlight the urgent need for targeted public health initiatives aimed at improving stroke awareness, particularly among high-risk populations. Emphasizing the importance of timely hospital presentation and addressing systemic barriers could play a critical role in reducing delays and improving outcomes for stroke patients.

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AUTHOR CONTRIBUTIONS

Author	Contribution
Muhammad Umar Waheed*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Moeen Akhtar Malik	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Imran	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Nadir Hussain	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Malik Niaz Ahmed	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Shehnaz Malik	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Hafiz Naveed Anjum	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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