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ORIGINAL ARTICLE

Evaluation of acute stroke care services in Sindh, Pakistan: a situational analysis

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ABSTRACT

OBJECTIVE: To evaluate acute stroke care services in Sindh province of Pakistan.

METHODS: This cross-sectional descriptive study, conducted from January to May 2024, assessed stroke care services in hospitals across Sindh, Pakistan. The study included hospitals that admitted more than one stroke patient per month and excluded facilities such as maternity homes and rehabilitation centers. Data were collected via structured proformas from hospital administrators through phone and email, focusing on stroke admissions, acute services, and rehabilitation capabilities. Informed consent was obtained, and ethical approval was granted by the Shifa International Hospital Ethical Committee. Data analysis utilized SPSS version 20 for continuous and categorical variables.

RESULTS: Among the 34 surveyed hospitals, 15(44.1%) treated 1 to 10 stroke patients monthly, and 14 (41.2%) admitted over 300 patients annually. Neurologists were on staff in 15(44.1%) of hospitals, and 13 (38.2%) had stroke-trained physicians available 24/7. CT brain scans were accessible 24/7 in 23 (67.6%) of hospitals, with 19(55.9%) prioritizing these scans for stroke patients. Stroke units and 24/7 availability of intravenous tissue plasminogen activator (TPA) were available in 07 (20.6%) of hospitals only. Inpatient rehabilitation facilities were available in 21(61.8%) of hospitals, and 13 (38.2%) collaborated with external rehabilitation centers. Community stroke awareness programs were established in 12 (35.3%) of hospitals, and 09 (26.5%) had designed stroke prevention programs.

CONCLUSION: The study highlights significant gaps in acute stroke care services in Sindh, Pakistan, emphasizing the need for improved access to thrombolytic therapy, specialized training, and community awareness programs.

KEYWORDS: Stroke (MeSH); Health Services (MeSH); Acute Diseases (MeSH); Stroke Unit (Non-MeSH); Tissue Plasminogen Activator (MeSH); Thrombolytic Therapy (MeSH); Thrombectomy (MeSH); Mechanical Thrombolysis; Needs Assessment (MeSH); Pakistan (MeSH); Sindh (Non-MeSH).

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INTRODUCTION

Cerebrovascular accidents (CVAs), commonly known as strokes, are significant health events that affect individuals globally, posing substantial challenges to both patients and caregivers.[1] According to the 2019 Global Burden of Disease (GBD) data, approximately 12.2 million new stroke cases were reported, resulting in 143 million disability-adjusted life years (DALYs) lost and 6.6 million stroke-related deaths worldwide. Stroke is now the second leading cause of death and the third leading cause of disability. Over the past three decades, the incidence of stroke has increased by 70%, the prevalence by 85%, and stroke-related deaths by 43%.[2,3]

In Pakistan, stroke imposes a considerable burden on the population, increasing the demand for financial, human, healthcare, and economic resources. According to the Khyber Pakhtunkhwa Integrated Population Health Survey (KP-IPHS) 2016-17, the prevalence of stroke in Khyber Pakhtunkhwa is approximately 1.2%.[4]

In recent years, the risk of stroke has nearly doubled, particularly in developing countries, which account for about 85% of all stroke-related deaths.[5] In Pakistan, the average age of stroke onset is nearly ten years younger than that in Western countries.[6] A study by Hou S, et al. revealed that in 2019, approximately 13.98% of ischemic stroke deaths in Pakistan were attributed to tobacco use, contributing to 5,457 deaths at a rate of 2.44 per 100,000 people. Significant gender disparities were observed, with 3,913 deaths (3.41 per 100,000) among males and 1,544 deaths (1.41 per 100,000) among females.[7]

With a population exceeding 180 million, Pakistan has only about 170 neurologists, resulting in a ratio of one neurologist per 1.05 million people. Consequently, stroke care is frequently managed by family physicians and internists.[8] Stroke units, which are crucial in reducing mortality, disability, and long-term care requirements, are limited in Pakistan, with only around 10 such units, and just six of these offer intravenous thrombolysis (r-tPA). Traditionally, stroke patients have been treated in general medicine, neurology, and geriatric medicine departments.[8-10]

According to Owolabi MO, et al., 91% of high-income countries have stroke units, compared to only 18% in low-income nations. Acute stroke treatments are available in about 60% of high-income countries, while only 26% of low-income countries offer these services. Additionally, low- and middle-income countries (LMICs) have significantly fewer rehabilitation services, including inpatient care, community-based rehabilitation, and early hospital discharge programs, when compared to high-income nations.[11]

Langhorne P, et al. provided moderate-quality evidence indicating that stroke patients receiving structured inpatient care in dedicated stroke units have a higher likelihood of being alive, independent, and living at home one year after their stroke. These benefits were observed across various age groups, sexes, stroke severities, and types, with the greatest advantages seen in units specifically located within stroke-dedicated wards.[12] While significant research in Pakistan over the past decade has focused on stroke risk factors and patient outcomes, there remains a considerable gap in data regarding the current state of stroke services and facilities in the country. This study aimed to evaluate the acute stroke care services in Sindh province of Pakistan.

METHODS

This cross-sectional descriptive study, conducted from January to May 2024, assessed stroke care services in hospitals across Sindh, Pakistan. The study focused on hospitals that regularly admit and treat stroke patients, with eligibility criteria requiring hospitals to admit more than one stroke patient per month. Facilities such as maternity homes, psychiatric hospitals, nursing homes, and rehabilitation centers were excluded to ensure the focus remained on medical facilities providing acute stroke care. Data collection and analysis were conducted over the six-month period to evaluate the state of stroke services in the region.

A purposive sampling method was used to select hospitals based on the established eligibility criteria. Contact information, including phone numbers and email addresses, was obtained from publicly available sources such as hospital directories, official websites, and health department databases. Hospital administrators responsible for clinical services-such as medical directors, department heads, and stroke unit coordinators-were contacted via phone or email. Data was collected using a structured proforma, covering areas such as stroke admissions, availability of acute stroke services (including imaging facilities, relevant personnel like neurologists, radiologists, and neurosurgeons), IV thrombolysis, mechanical thrombectomy, stroke unit care, and access to speech and occupational therapy. Additionally, the study evaluated rehabilitation services and the expertise of physicians managing stroke cases.

Informed consent was obtained from all hospital administrators. The study received ethical approval from the Shifa International Hospital Ethical Committee in Islamabad (IRB#1021-296-2018). To ensure confidentiality and reduce bias, data analysts and investigators were blinded to the final list of participating hospitals. Data analysis was performed using SPSS version 20, with continuous variables presented as means and standard deviations, and categorical variables as numbers and percentages.

RESULTS

Among the 34 surveyed hospitals, the majority 15 (44.1%) reported treating between 1 and 10 stroke patients per month, while 12 (35.3%) treated more than 30 patients monthly. In terms of annual stroke admissions, 12 (35.3%) hospitals admitted 1 to 100 patients per year and 14 (41.2%) hospitals admitted more than 300 patients annually. Table I presents a summary of hospital staffing, including the availability of key personnel such as neurologists, stroke-trained physicians, and diagnostic

Table I: General structures of the surveyed hospitals

Variables		Frequency	Percentage
Number of patients treated per month at the unit	1-10	15	44.1
	11-20	2	5.9
	21-30	5	14.7
	>30	12	35.3
Number of acute stroke admitted in your hospital in a year	1-100	12	35.3
	101-200	5	14.7
	201-300	3	8.8
	>300	14	14.2
Neurologist on staff at your unit (Yes)		15	44.1
Stroke trained physician present 24/7 at stroke unit (Yes)		13	38.2
Diagnostic radiologist on call (Yes)		15	44.1
Multidisciplinary team (Yes)		13	38.2
ER department in house present (Yes)		29	85.3
Stroke unit available in hospital (Yes)		07	20.6
Stroke outpatient clinic with a certified stroke specialist present (Yes)		10	29.4
Neuromedicine ICU at hospital (Yes)		26	76.5

Table II: Availability of diagnostic imaging and monitoring facilities for stroke patients in surveyed hospitals

Variables		Frequency	Percentage
CT brain available 24/7 (Yes)		23	67.6
Is there CT priority for stroke patients available (Yes)		19	55.9
Average time lapse between patient arrival and performance of the CT Scan	None	17	50
	1-5 hours	14	41.2
	6-10 hours	1	2.9
	21-30 hours	2	5.9
CT angiography available (Yes)		13	38.2
MRI available at 24/7 (Yes)		15	44.1
Diffusion weighted MRI available at hospital (Yes)		12	35.3
Extracranial doppler sonography available at centre (Yes)		16	47.1
Transthoracic Echocardiography available at centre (Yes)		24	70.6
Transoesophageal echo available (Yes)		14	41.2
Conventional Angiography available at unit (Yes)		14	41.2
Automated ECG monitoring at bedside for stroke patient (Yes)		25	73.5
Automated Monitoring of BP for stroke patients (Yes)		26	76.5
Breathing monitoring (Yes)		24	70.6
Monitoring of temperature for stroke patients (Yes)		33	97.1

Table III: Thrombolytic Therapy and Stroke Care Protocols in Hospitals

Variables		Frequency	Percentage
Number of stroke patients treated by thrombolytic therapy in hospital	0	30	88.2
	1-50	4	11.8
Facility of administration of Intravenous tissue plasminogen activator available 24/7 at unit (Yes)		7	20.6
Facility of Intra-arterial Thrombolysis 24/7 at unit (Yes)		3	8.8
Endovascular surgery services at centre (Yes)		6	17.6
Stroke unit have designed stroke care map for patients admission (Yes)		6	17.6
Stroke unit have developed protocols for intravenous RT-PA administration 24/7 (Yes)		4	11.8
Stroke unit have formulated stroke pathways which are implemented at hospital (Yes)		7	20.6

radiologists, as well as the presence of specialized units and services. A neurologist was available on staff in 15 (44.1%) of the hospitals, while 13 (38.2%) had a stroke-trained physician available 24/7 at the stroke unit.

Table II outlines the availability of essential diagnostic tools, including 24/7 access to CT brain scans, CT angiography, MRI, diffusion-weighted MRI, extracranial doppler sonography, transthoracic echocardiography, transesophageal echocardiography, conventional angiography, automated ECG, and monitoring of blood pressure, respiration, and temperature. CT brain scans were available 24/7 in 23 (67.6%) of hospitals, while 19 (55.9%) provided priority access to CT scans for stroke patients. In majority of hospitals 17 (50%) CT scans were immediately performed without any delay, while 14 (41.2%) completed CT scans within 1 to 5 hours.

Table III highlights stroke care practices, such as the number of hospitals administering thrombolytic therapy, the availability of intravenous tissue plasminogen activator (TPA), and facilities for intra-arterial thrombolysis. In the majority of hospitals 27 (79.6%), no intravenous tissue plasminogen activator (TPA) was available for stroke patients, whereas TPA was available for administration 24/7 in 07 (20.6%) of hospitals.

Table IV provides insights into inpatient rehabilitation services, partnerships with external rehabilitation centers, and community-based stroke awareness and prevention programs. Inpatient rehabilitation facilities were available for admitted stroke patients in 21(61.8%) of hospitals.

DISCUSSION

Our study provides a comprehensive evaluation of current stroke care services in Sindh, Pakistan, focusing on patient volumes, treatment practices, and rehabilitation options. By comparing our findings with the World Stroke Organization's Global Stroke Guidelines and Action Plan, we can identify areas where Pakistan's stroke care aligns with international benchmarks and where improvements are needed. [13]

Table IV: Availability of rehabilitation and stroke awareness programs in hospitals

Variables	Frequency	Percentage
Is there facility of inpatient rehabilitation available for admitted stroke patients (Yes)	21	61.8
Stroke unit have collaboration with outside rehabilitation centre for stroke patients discharged from hospital (Yes)	13	38.2
Stroke unit have community stroke awareness programme designed (Yes)	4	11.8
Is there a stroke prevention program designed? (Yes)	7	20.6

Our research indicates that only a few hospitals in Sindh have dedicated stroke units, and not all are staffed by stroke-trained physicians and neurologists. Although access to diagnostic services like CT scans is generally adequate, with most hospitals providing 24/7 availability, advanced imaging techniques such as MRI and CT angiography are limited. While only a few hospitals offer intravenous TPA around the clock. Siddique A, et al. reported fewer than ten stroke units in Pakistan, with no comprehensive stroke center in the country. Mechanical thrombectomy, crucial for acute stroke treatment, is available in only four hospitals nationwide.[14] Ranawaka UK, et al., highlighted significant deficiencies in existing stroke services, noting only 38 neurologists in state-sector hospitals, thrombolysis in just 14 hospitals, and mechanical thrombectomy in only one. Stroke units were available in only nine hospitals.[15] In contrast, since 1999, Thailand has seen a substantial increase in stroke units, expanding from one to 116, while India has approximately 400 to 500, and Nepal has as few as two.[16]

While acute stroke care services in the Southeast Asia Region (SEAR) have gradually improved, they still reveal significant gaps in both availability and consistency. Access to and utilization of evidence-based acute stroke treatments, such as thrombolysis, remain limited.[17,18] Various studies conducted in specific regions of India have reported alarmingly low rates of intravenous (IV) thrombolysis, ranging from 0.5% to 3.6%.[19,20] More recent data from the Indo-US registry indicates a thrombolysis rate of 11.5%; however, since this data reflects only five major tertiary centers, it likely does not provide an accurate representation of national thrombolysis rates.[21]

In our study, most surveyed hospitals offer inpatient rehabilitation services; however, collaboration with external rehabilitation centers and community engagement efforts, such as stroke awareness and prevention programs, is less frequent. In Bangladesh, rehabilitation services are primarily provided by the private sector, making them financially inaccessible for much of the population, similar to the situation in India.[22,23] In Thailand, access to post-stroke rehabilitation varies significantly across different stages, with most patients receiving physiotherapy, while other rehabilitation specialties remain largely unavailable.[24] Mansoor SN, et al. noted that only a minority of institutions in Pakistan possess the necessary resources and facilities to deliver comprehensive multidisciplinary stroke rehabilitation services in a centralized manner.[25]

To elevate stroke care in Pakistan to an advanced standard, targeted efforts are crucial to strengthen infrastructure, enhance workforce training, standardize care protocols, and promote collaboration among healthcare providers and community partners. By aligning with international standards and investing in quality enhancement initiatives, Pakistan can advance its stroke care services. This approach seeks to improve patient outcomes and mitigate the impact of stroke on individuals and communities.

Limitations of the study

The study's limitations include the lack of on-site verification of data, which may have introduced reporting inaccuracies and affected the study's reliability. Moreover, the cross-sectional design restricts the ability to assess changes in stroke unit characteristics over time, providing only a snapshot of the current status of stroke services in Pakistan.

CONCLUSION

This study offers valuable insights into the current state of stroke care services in hospitals across Sindh province of Pakistan. While essential acute stroke care services are available, significant gaps remain. Most hospitals provide basic diagnostic and thrombolytic therapies; however, specialized facilities such as dedicated stroke units and 24/7 availability of intravenous TPA are limited. It is crucial to enhance stroke care infrastructure, implement evidence-based guidelines, and strengthen community-based interventions to improve outcomes and mitigate the impact of stroke in Pakistan.

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AUTHORS' CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

AM , MS , BAT & STAA: Concept and study design, drafting the manuscript, critical review, approval of the final version to be published

MAK: Acquisition, analysis and interpretation of data, critical review, approval of the final version to be published

KA, AA & NW: Acquisition of data, drafting the manuscript, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

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