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Original Research

Neuroscience in Acute Stroke Treatment: Current Strategies and Emerging Therapies in Pakistan

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ABSTRACT

Objective: To discuss the current strategies and emerging therapies in treating acute stroke in Pakistan. Explores how personal beliefs influence health behavior and decision-making.

Materials & Methods: The present qualitative study of neuroscience in acute stroke treatment was carried out at the Department of Neurology at Aziz Fatimah Medical and Dental College, Faisalabad. The theoretical concepts of the Health Belief Model (HBM) apply to explore how personal beliefs influence health behavior and decision-making in acute stroke treatment, strategies, and emerging therapies. All acute stroke patients of the Department of Neurology from June 2023 to June 2024 were interviewed for thematic analysis. Interviews were transcribed on MS Word, and then they were coded using software called QDA Miner Lite.

Results: The study found intravenous thrombolysis, mechanical thrombectomy, stroke units, and tele-stroke services, which could gradually be made a part of the healthcare infrastructure. Improvement in stroke management is expected with emerging therapies like neuroprotective agents and stem cell therapy also helpful for acute stroke treatment. The study found major problems in awareness and accessibility of acute stroke treatment, current strategies, and emerging therapies.

Conclusion: The study revealed that stroke care optimization in Pakistan reduces the burden of disabilities and mortality related to stroke. Although most significant urban centers offer advanced care for stroke patients, accessibility to their services is still not present for those residing in remote and rural areas.

Keywords: Acute Stroke Treatment, Strategies, Emerging Therapies, Health Belief Model and Thematic Analysis.

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INTRODUCTION

Stroke is a critical public health concern in the

world, accounting for many of the causes of mortality and morbidity in Pakistan, and it has a remarkable burden on the health care system and society.[1] Tremendous strides have been made in managing acute stroke over the last few decades, with great success in improving patient outcomes. It will discuss the current and upcoming strategies of acute stroke treatment in Pakistan what has been achieved and the challenges that are otherwise still prevalent.[2-3]

Intravenous thrombolysis using recombinant tissue plasminogen activator (rt-PA) is still the standard of care for eligible stroke patients presenting within the window of 4.5 hours from the onset of symptoms.[4] IVT administration in time significantly reduced disability and improved functional outcomes. Healthcare facilities in Pakistan have gradually adopted IVT protocols, and increased efforts have been noticed in the orientation of health professionals about the benefits and risks alternatives related to this therapy.[5]

Mechanical thrombectomy is a revolutionary procedure where the clot responsible for the stroke is removed using special devices. It has revolutionized the approach to managing acute ischemic strokes with large vessel occlusions. Although this facility was so far limited to a few major stroke centers, it is now slowly and gradually being made available in Pakistan, which is considered to be a game changer for change in the management of acute strokes.[6] The setting up of dedicated stroke care units at the hospital level has been a remarkable innovation in the best possible management of stroke. These are professionally conducted units where evidence-based management of stroke is carried out, which turns out to be associated with favorable outcomes. Stroke units have sprung up across most hospitals in Pakistan with the mandate to ensure timely diagnosis, continuous monitoring, and immediate intervention of stroke patients.[7]

Technological advances have been able to allow tele-stroke services, which would provide an opportunity for remote area patients to consult with specialists. It has significantly reduced the urban-rural gap in stroke care by enabling easy and fast suggestions regarding treatment after quick evaluation by neurologists in cities. Tele-stroke services have been slowly incorporated within the health infrastructure in Pakistan and allow greater access to expert attention by less-privileged people.[8] Other researchers are working on the identification of the probable neuroprotective agents that could help to minimize brain injury as a result of stroke. Much research is currently underway on clinical trials on drugs that may lessen the magnitude of injury and enhance recovery. Pakistan has also been endeavoring to keep pace with the rest of the world, assessing the potential role of neuroprotective agents in managing acute ischemic stroke by being a part of international study research.[9]

In providing effective brain tissue repair and improving functional recovery following a stroke, stem cell therapy has been proven. Although still in the experimental stage, some preliminary studies have obtained favorable outcomes regarding stem cell therapy.[10] Local research groups, therefore, are combining efforts with international institutions inside Pakistan to explore further the possibilities and advantages related to using stem cell therapy as an adjunct to conventional treatment for their patients. Although many advances have been made, challenges still exist within the acute stroke treatment landscape in Pakistan. Awareness and enlightenment campaigns would be even more critical to sensitize the public on stroke signs and the need for immediate medical care. Furthermore, continued professional education within the health sector will place healthcare professionals in a better position to recognize stroke and hasten the treatment process.[11-12]

MATERIALS AND METHODS

Study Setting and Duration

The proposed study followed a qualitative research approach, involving the use of the semi-structured interview as the primary method. This study was carried out at the Department of Neurology at Aziz Fatimah Medical and Dental College, Faisalabad. The Health Belief Model (HBM) was applied to explore how personal beliefs influence health behavior and decision-making in acute stroke treatment, strategies, and emerging therapies at the Department of Neurology from June 2023 to June 2024.

Sample and Sampling Technique

Five hundred (n=500) stroke patients were interviewed for thematic analysis. Non-probability sampling techniques were used for specific characteristics or experiences of patients.

Inclusion & Exclusion Criteria

Stroke patients who have been diagnosed with an acute ischemic or hemorrhagic stroke, adults aged 18 years and older, currently receiving acute stroke treatment thrombolysis, thrombectomy were included. Patients who were medically unstable or critically ill were excluded from the study.

Data Collection

Patients interviewed Strengthened stroke registries and research initiatives confer the advantage of understanding how stroke patterns, risk factors, and treatment outcomes lie in this particular context of Pakistan. Such data would provide evidence-based guidelines and facilitate tailoring the management of strokes based on local needs. Semi-structured interview technique is a useful technique for data collection as these interviews assist in gaining the perceptions of respondents in detail. While conducting the interviews, the patients were permitted to respond to the questions according to the choice of their language: Urdu and English.

Data Analysis

Qualitative data analysis included the tasks of defining, theorizing, explaining, exploring, and mapping. The present data analysis of interviews first involved recording and transcription of the information. It was ensured that the time lag between recording and transcription was minimized to enable a smooth analysis process. After transcription, the data was 'coded.' Initial coding was 'the first step in data reduction' and this was the probe by which the researcher identified patterns, sequences, or relationships in the recorded information. As themes began to emerge following coding, the information became sharper and more focused. The major themes were extracted, and descriptive interpretations of the themes generated were provided under the conceptual maps for each major theme. Interviews were transcribed on MS Word, and then they were coded using software called QDA Miner Lite.

RESULTS

Demographics

The distribution of patients' ages, reveals a diverse age range within the study sample. The largest group, comprising 37.7% of the participants, falls within the 18-30 years category, while 46.6% are aged between 31 and 50 years. A smaller portion, representing 15.7% of the total, is 51 years and above. Next, the educational levels of patients are examined. Significant proportions are found in various educational categories: 28.0% with Matric education, 23.7% with Middle education, and 18.3% with Intermediate education. Illiterate participants make up 6.9% of the sample. Further examines total family income per month, revealing that 38.3% fall into the upper-income bracket (> 30,000), while 31.1% and 30.6% are categorized as

lower (less than 20,000) and middle (20,000-30,000) income levels, respectively.

Thematic Analysis

Thematic analysis was used for this study to analyze the qualitative data of the participants. It offers an accessible, easy, and flexible approach for analyzing the data that searches for themes or patterns to answer questions with intensive explanations. The subthemes were generated by using that coded information and then those subthemes were merged to form possible themes so that the results could be finalized. The four stages 1) Strategies, 2) Therapies, 3) Challenges, and 4) Recommendations which are involved in thematic analysis are described.

Table 1 shows that the strategy involved the administration of rt-PA to break down blood clots within a critical time window of 4.5 hours after stroke symptom onset. In Pakistan, there is an increasing adoption of this treatment in healthcare facilities, supported by ongoing education and training of healthcare professionals to ensure effective implementation. The next table presents the mechanical thrombectomy strategy there were also significant differences found in strategy, description, and current status in Pakistan. Further table shows that the strategy of telestroke services, description, and current status in Pakistan were also significant to each other.

Table 2 shows that emerging therapies like neuroprotective agents and stem cell therapy found significant differences in description and current status in Pakistan.

Table 3 shows the insufficient public knowledge about stroke symptoms and the critical need for prompt medical attention. There was a lack of awareness resulted in patients arriving late at

Themes I: Current Strategies

Table 1: Current Strategies in Acute Stroke Treatment.

Strategy	Description	Current Status in Pakistan
Intravenous Thrombolysis	Use of recombinant tissue plasminogen activator (rt-PA) within 4.5 hours of symptom onset to reduce disability and improve outcomes.	Increasing adoption in healthcare facilities with ongoing education for healthcare professionals.
Mechanical Thrombectomy	Removal of blood clots using specialized devices, particularly for large vessel occlusions.	Gradually increasing accessibility; initially limited to major stroke centers.
Stroke Units	Dedicated hospital units staffed with trained professionals following evidence-based protocols for optimized stroke care.	More prevalent in Pakistani hospitals, ensuring prompt diagnosis, monitoring, and treatment.
Telestroke Services	Use of technology to provide expert consultations for stroke patients in remote areas, reducing urban-rural disparity in stroke care.	Gradually integrated into healthcare infrastructure, improving access to specialized care.

Subthemes: Emerging Therapies

Table 2: Emerging Therapies in Acute Stroke Treatment.

Therapy	Description	Current Research and Status in Pakistan
Neuroprotective Agents	Drugs aimed at limiting brain damage during a stroke and enhancing recovery.	Participation in global research studies to evaluate efficacy; various clinical trials underway.

Stem Cell Therapy	Promotes brain tissue repair and improves functional recovery after a stroke.	Collaborative efforts between local and international institutions; are still in experimental stages.

Themes II: Challenges

Table 3: Challenges in Acute Stroke Treatment.

Challenge	Description	Impact
Awareness and Education	Limited public awareness about stroke symptoms and the importance of immediate medical attention.	Delayed arrival of patients to healthcare facilities, hindering timely intervention.
Access to Specialized Centers	Concentration of advanced stroke care in urban areas, limiting access for patients in rural and remote regions.	Disparities in quality care between urban and rural areas.
Data Collection and Research	Need for robust stroke registries and research initiatives	Lack of evidence-based guidelines tailored to local needs.

Themes III: Recommendations & Improvements

Table 4: Recommendations for Improving Stroke Care.

Recommendation	Description	Expected Outcome
Public Awareness Campaigns	Educating the population about stroke symptoms and prompt action	Improved stroke recognition and timely medical attention
Expansion of Stroke Services	Extending advanced stroke care to peripheral regions, supported by telemedicine	Equitable access to specialized stroke care
Strengthening Research Initiatives	Enhancing stroke registries and research collaborations to develop evidence-based guidelines	Tailored stroke management strategies for the Pakistani population

healthcare facilities, which delays necessary interventions and negatively impacts outcomes. There were no advanced stroke care facilities predominantly located in urban areas, creating a significant accessibility gap for patients in rural and remote regions. There was a pressing need for comprehensive stroke registries and focused research initiatives to improve understanding and treatment of stroke.

Table 4 shows that the campaigns aim to educate the public about the symptoms of stroke and the critical need for immediate medical intervention. Further expansion of stroke services was focused on extending advanced stroke care services to peripheral and rural regions, leveraging telemedicine to bridge gaps in access. Next strengthening research initiatives was enhancing stroke registries and promoting research collaborations are crucial for developing evidence-based guidelines tailored to the local population.

DISCUSSION

The discussion section of this paper will reflect on the implications of the advances in acute stroke treatment in Pakistan. It will highlight the relevance of current strategies and therapies at an emergency stage, their potential consequences on stroke care, and the challenges to be taken up for betterment in outcomes. The availability of and treatment with intravenous thrombolysis and mechanical thrombectomy in Pakistan are a remarkable development in the care of the acute stroke population. These interventions restore blood flow to the brain regions targeted by stroke and are also very effective in minimizing the disability if they are given early. The organization of stroke units has similarly been paramount in

providing specialized care, thereby leading to better patient outcomes. The adoption of telestroke services has bridged the gap between the urban and rural areas so that all centers, even the remote ones, are offered expert consultation services, which act as though interventions can be done timely.[13]

Indeed, some interest exists in further enhancing current acute stroke treatment with these emerging therapies: neuroprotective agents and stem cell therapy. These hold the potential to limit brain damage and improve recovery besides currently possible endovascular treatment. At any rate, caution and a solid clinical trial should establish safety and use before implementation.[14]

While a lot has been achieved, there are still quite a good number of challenges to the operational nature of acute stroke embodiments in Pakistan. Public awareness concerning symptoms and the need for prompt health services is deficient. Due to this lack of knowledge, patients frequently report late at healthcare facilities when the prime time of life-saving interventions is over. Besides, the clustering of specialized stroke centers in urban locations creates differences in access to quality care, especially for rural and remote patients.[15]

Meeting such challenges will require the cooperation of health authorities, policymakers, and stroke care providers. Public education cannot be underestimated. Focused educational campaigns can help raise awareness in the general population and thus foster communities that are more alert to stroke and prepared to act quickly if need be. The use of telemedicine to extend stroke services to outlying areas is one of the ways to ensure total countrywide access to stroke services.[16]

Stroke registries and research initiatives should be enriched to develop evidence-based guidelines that apply to the specific needs of the Pakistani population. Such a collaboration will bring important information to light regarding patterns of stroke, risk factors, and treatment outcomes, which will go a long way in refining the strategy for stroke management in this part of the world.[17]

Future Directions

The advances in acute stroke treatment discussed this article demonstrates substantial progress in improving stroke care in Pakistan. However, the journey does not end here. Continuous efforts are required to refine existing strategies, implement emerging therapies responsibly, and tackle the challenges hindering optimal stroke care delivery. By combining these efforts, Pakistan can further reduce the burden of stroke-related disabilities and mortality and enhance the quality of life for stroke survivors.

CONCLUSION

Advances in acute stroke treatment in Pakistan have brought hope for better outcomes among stroke patients. With the integration of evidence-based therapies like IVT and mechanical thrombectomy and the potential of emerging therapies, the landscape of stroke management in Pakistan is evolving positively. However, continued efforts are needed to address challenges related to awareness, accessibility, and research, ultimately improving stroke care across the nation and reducing the burden of stroke-related disabilities and mortality.

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Additional Information

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Human Subjects: Consent was obtained by all patients/participants in this study.
Conflicts of Interest:
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
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AUTHORS CONTRIBUTION

Sr.#	Author's Full Name Intellectual	Contribution to Paper in Terms of:
1.	Atif Maqsood & Faizan Aslam	Study design, Data Collection, and methodology.
2.	Faizan Aslam & Nadia Zulfiqar	Thematic analysis.
3.	Muhammad Absar Alam & Mubarak Ali Anjum	Introduction and References.
4.	Muhammad Umair Saleem	Paper writing.