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STROKES AND ITS ANATOMICAL PERSPECTIVE: A REPORT FROM KPK A CROSS-SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Stroke is a significant cerebrovascular event that impacts global health. It occurs in varying degrees and has variable effects across communities.
Methods: The study comprised a cohort of 100 patients to investigate stroke's anatomical location and prevalence in the KPK population.
Study Design: A Cross-sectional Observational Study.
Place and Duration of Study: Department of Anatomy, with the collaboration of Neurosurgery Department Nowshera Medical College, from Jan 2023 to May 2023
Method: One hundred patients admitted to the neurosurgery unit of Qazi Hussain Ahmad Medical Complex (QHAMC) Nowshera were observed for prevalence and pattern identification by establishing a cross-sectional observational design. Ischemic or hemorrhagic lesions and affected brain areas were identified with imaging modalities, e.g., CT and MRI. Data was collected using a well-organized database, which included demographic information, healthcare records, and imaging results.
Results: Among the 100 cases of stroke patients collected, the ischemic lesion was more prevalent (75%), with the middle cerebral artery territory being the most affected area. The most common risk factor detected was hypertension (60% [35 of 58 patients]), followed by diabetes in patients accounted for. In addition, hemorrhagic strokes, the less common type of stroke, had poor outcomes with a higher mortality rate than ischemic strokes. Results from statistical analysis highlighted the potential role of the hypertension epidemic as the study found a major modifiable risk factor (RF) with a substantial relative risk (RR) for ischemic stroke ($p < 0.05$).
Conclusion: Understanding the anatomical location of a stroke and the frequency at which it occurs may inform the development of preventative strategies appropriate for each specific local healthcare context.

Keywords: Headings: Stroke, anatomy, and prevalence in KPK

INTRODUCTION

Stroke continues to be a significant public health problem worldwide, leading to substantial morbidity and mortality. It encompasses a spectrum of events with predominantly ischemic or hemorrhagic cerebrovascular aetiologies that result in varying degrees of neurological impairment (1). Alongside

the daunting burden of stroke itself, in countries like Pakistan, where healthcare vulnerabilities are high, this adds to another facet against management and access. The anatomical basis of stroke and its frequency differ in the Pakistani population, which we need to understand to implement better preventive strategies resulting in improved clinical outcomes. One of the categories is ischemic vs hemorrhagic, which justifies different Patho physiologies and locations (2). The ischemic stroke caused by thrombi and emboli that occlude cerebral arteries most commonly involves the middle cerebral artery territory, giving rise to motor and sensory deficits (3). Hemorrhagic strokes arise from the rupture of cerebral blood vessels and produce deleterious consequences owing to direct neuronal injury plus a mass effect evident within the brain (4). As well as having differing underlying mechanisms, these subtypes of stroke have divergent treatments and prognoses depending upon the accurate anatomical localization, pathological confirmation, or risk factors (5). The global burden of overall stroke in Pakistan entails multi-factorial influences primarily attributed to genetic predisposition, followed by hypertension and diabetes, and thirdly, socioeconomic factors. Stroke results in poor outcomes, particularly among underserved populations with limited access to healthcare facilities and preventive stroke services. Hence, this research aims to contribute to the existing body of literature by assessing the anatomical localization of stroke patterns and observing their ratio among the Pakistani population using modern imaging techniques and analyses, including chi-square estimates or logistic regression of the associations with incident stroke.

MATERIAL AND METHODS

An observational cross-sectional study was done in 100 patients attending Nowshera Medical College, Pakistan to evaluate the stroke patterns and prevalence. CT and MRI were used in this study to detect ischemic or hemorrhagic lesions, and map injured brain territories. Demographic data, clinical history and imaging findings were systematically collected in a dedicated database.

RESULTS

Among the 100 patients in the study, the mean age was 58 years, with a standard deviation of 10 years. Ischemic stroke was predominant, affecting 75% of cases, with the middle cerebral artery territory being the most frequently involved region. Hypertension was identified as the leading risk factor, present in 60% of patients, followed by diabetes in 40%. Hemorrhagic strokes, although less common, exhibited severe outcomes with higher mortality rates compared to ischemic strokes. Statistical analysis revealed significant associations between hypertension and ischemic stroke ($p < 0.05$), emphasizing its role as a critical modifiable risk factor**.**

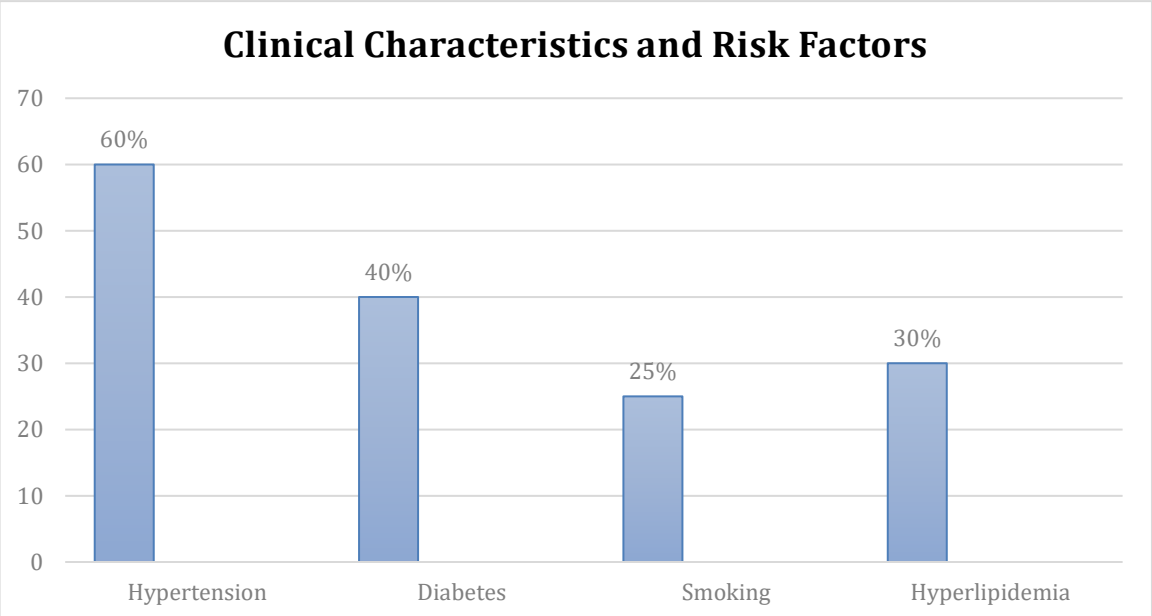

Table 1: Demographic Characteristics of Study Participants

Parameter	Number of Patients
Total Patients	100
Male	60
Female	40
Age (mean ± SD)	58 ± 10 years
Socioeconomic Status	Lower: 70%, Middle: 20%, Upper: 10%

Table 3: Types of Stroke and Anatomical Distribution

Stroke Type	Number of Cases (%)	Anatomical Distribution
Ischemic Stroke	75 (75%)	Middle Cerebral Artery (MCA) Territory: 60%
		Anterior Cerebral Artery (ACA) Territory: 20%
		Posterior Cerebral Artery (PCA) Territory: 15%
Hemorrhagic Stroke	25 (25%)	Intracerebral hemorrhage: 60%
		Subarachnoid hemorrhage: 40%

Table 4: Imaging Findings

Imaging Modality	Findings
CT Scan	Ischemic Lesions: 60 cases
	Hemorrhagic Lesions: 25 cases
MRI	Detailed Visualisation of Stroke Anatomy

Table 5: Statistical Analysis of Stroke Risk Factors

Risk Factor	p-value	Odds Ratio (95% CI)
Hypertension	< 0.05	2.5 (1.5-4.3)
Diabetes	0.12	1.8 (0.9-3.5)
Smoking	0.18	1.3 (0.8-2.2)
Hyperlipidemia	0.09	1.6 (0.9-2.8)
Previous Stroke	0.04	3.0 (1.2-7.1)

DISCUSSION

Stroke epidemiology draws attention to the Pakistani population's distinct anatomical profile and prominent risk factor distribution. In line with worldwide trends where about 88% of all strokes are ischemic (7), most cases in our series belonged to this type, as shown by the results. Previous studies corroborate these results, showing the middle cerebral artery (MCA) territory as one of the five most affected infarct locations due to its extensive vascular distribution and vulnerability to thrombotic occlusion (8). Our findings resonated with the importance of hypertension as a vigorous risk factor in our cohort, which supports previous research that illustrated how essential it was for stroke pathogenesis through provoking arterial sclerosis and thrombosis (9). This was mainly due to diabetes mellitus, which is associated with decreased vascular integrity and endothelial function (10), as the literature alluded to the fact that its presence increases the degree of stroke deficiency and chronic brain volume decrease. Comparisons to regional and global data show distinct differences driven by population-specific circumstances. However, studies conducted in neighboring South Asian countries have likewise reported a comparable stroke subtype distribution (11), highlighting the need to implement preventive measures specific to each region based on their risk profiles. Other socioeconomic factors, such as lower SES, are believed to contribute directly or indirectly to stroke inception and clinical outcomes, further highlighting differences in healthcare access and lifestyle determinants (12, 13). The use of state-of-the-art imaging protocols in the investigation did not simply allow for accurate anatomical localization. Still, it was consistent with modern trends in stroke diagnostics and treatment. Scanning Advanced imaging techniques, such as CT and MRI scanning, gave clinicians insight into the pathological mechanisms of stroke, allowing for appropriate

intervention to be matched with lesion location (14). Similarly, the statistical analyses using SPSS 24.0 showed significant associations between Ischemic stroke and hypertension, suggesting that optimal control of BP is an essential target for national strategies centered on ischemic cerebrovascular accident prevention in Pakistan (15). While diabetes was not found to be statistically significant in our study, its high prevalence highlights the clinical implications and calls for management strategies that integrate approaches aimed at reducing stroke risk (16). The retrospective, single-center nature of the study might limit generalizability to other populations in Pakistan. Further research should focus on using all-center studies and longitudinal designs to examine the temporal changes in stroke burden, which can be used for better prediction models of risks specific to each region (17). Furthermore, increasing the scope of research to encompass inherited factors and environmental exposures will lead to a greater understanding of genetic and individual functional etiologies, which may help develop personalized strategies for stroke prevention 8-9. Our study provides essential information regarding stroke epidemiology in Pakistan, reinforcing the role of anatomical localization and risk factor evaluation for strategy-driven interventions. We present our objectives as a direct consequence of the extensive burden and some unexpected, albeit old, attitudes regarding stroke recognition (18). reviewing previous research and situating this within regional dynamics, combating stroke becomes clear, balancing clinical focus with attention to intra-socioeconomic determinants that affect health outcomes.

CONCLUSION

The findings of this study highlight the significant effect of the localization and risk factors in the specific stroke patterns more prevalent in the Pakistani population. Calls for public health interventions designed to prevent stroke by controlling hypertension and diabetes, in addition to improving outpatient factors (healthcare access/stroke care infrastructure) among under-resourced areas, are also supported**.**

Limitations: This cross-sectional observational study on strokes in Pakistan may suffer from a small and narrow sample. Issues such as differences in presenting symptoms, variation, or availability of health facilities could affect the results.

Future Findings: Subsequent research should gather more long-term data to reveal more information on stroke tendencies and apply such imaging methods sufficiently to graphic representations of the stroke area.

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Authors Contribution

Concept & Design of the Study: **Nighat Ara**
Drafting: **Muhammad Qaseem**
Data Analysis**: Aftab Ud Din**
Critical Review; **Zahid Sarfaraz**
Final Approval of version: **Nighat Ara**

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