ASSESSMENT OF ISCHEMIC STROKE IN VARIOUS NEUROVASCULAR TERRITORIES AND ITS ASSOCIATEDRISK FACTORS ON COMPUTED TOMOGRAPHY IN REHMAN MEDICAL INSTITUTE, PESHAWAR

SHAHID IQBAL *

Rehman College of Allied Health Sciences RMI, Peshawar KPK Pakistan. *Corresponding Author

SAYED RASHID HUSSAIN

Rehman College of Allied Health Sciences RMI, Peshawar KPK Pakistan.

KOMAL SHAFIQ

Rehman College of Allied Health Sciences RMI, Peshawar KPK Pakistan.

RIMSHA NIAZ

Rehman College of Allied Health Sciences RMI, Peshawar KPK Pakistan.

Abstract

Background: Ischemic stroke is one of the considerable public health concerns with diverse clinical presentations and underlying risk factors. Understanding the dissemination of ischemic strokes in different neurovascular zones and identifying associated risk factors is crucial for optimizing prevention and management strategies. Methodology: The study was a descriptive cross-sectional study, which was based upon the secondary data collected from relevant patients' history file and report forms by the research team using questionnaires. The study was conducted from patient report forms ranging from (July 1, 2022-July 1, 2023) and was conducted in Rehman medical institute, Peshawar. Thedata was collected by non-probability convenience sampling using a self-structured questionnaire. Results: The distribution of ischemic strokes varied across neurovascular territories, with 160 (54.8%) patients were suffering from middle cerebral artery (MCA) territory, 96 (32.9%) patients were suffering from lacunar artery (LA) territory, 48 (16.4%) patients were suffering from anterior cerebral artery (ACA) territory, 39 (13.4%) patients were sufferingfrom internal carotid artery (ICA) territory, 38 (13%) patients were suffering from Vertebero-basilar arteries (VBA) territory, 37 (12.7%) patients were suffering from watershed / border zone territory and 28(9.6%) patients were suffering from posterior cerebral artery (PCA). Conclusion: Based on our data collection, we conclude that MCA territory strokes are the most commonwhile the PCA territory strokes are the least common among neurovascular strokes. Furthermore, we found that the incidence of stroke increases with age, as 5.8% of patientswere in the 40–49 age range. The highest percentage was seen in the age range of 70–79, followed by the 60–69 age range and then in the 50–59 age range. Our findings indicated that the primary risk factors for stroke were hypertension, atrial fibrillation, migraine and diabetes mellitus.

Keywords: Stroke, Neurovascular, Territories, Computed Tomography.

INTRODUCTION

Ischemic heart disease is the highest cause of mortality worldwide, with stroke coming in second (1). Yearly 795,000 people havea first or subsequent stroke (2). Globally, 80.1 million incidents of stroke were reported in 2016 (95% confidence interval: 74.1-86.3), of which 41.1 million (41.1–44.3%) were female and 39.0 million (36.–42.1%) were male (3).

A serious public health problem is stroke. It is the primary cause of death for both men and women in the US and the fourth and fifth leading causes of disability, respectively (4). Stroke incidence is higherin men than in women globally due to sexually dimorphic epidemiology, which persists into menopause and is ultimately eclipsed by the effects of ageing (5).

Understanding the breadth and depth of gender structural qualities in the brain, as well as the function of more generic sex centered traits, is necessary to lessen the impact of the stroke in both men plus women (4). In 2018 study by Luca Liberalea et al. predicted that expected to the ageing of the Western people, the prevalence of stroke would increase during the following decades. The majority of ischemic strokes (IS) victims are men over the age of 65, then postmenopausal women in older age groups (6).

With the highest prevalence observed among persons aged 75 to 85, at 584,000 per 650,000, Pakistan had an elementary age and sex-adjusted stroke incidence of 95 per 100,000 people per year from 2000 to 2016 (7). In 2016, there were 13.7 million new strokes, an increase from 2015 (8). 6.5 million People died from strokes in 2013, resulting in 113 million years of life with a disability. 75.2% of all stroke fatalities and 81.0% of stroke-related disability- adjusted life years occur in developing nations (9).

According to research conducted in Pakistan in 2019 by M Ishaq Khan et al., ischemic stroke significantly affects neurological morbidity and death. In a developing nation like Pakistan, where the healthcare system is subpar and resources are scarce (10). An annual report on the most recent findings on heart disease, stroke, and cardiovascular risk factors is published by the American Heart Association in partnership alongside the National Institutes of Health.

It covers fundamental health practises and other factors that support cardiovascular health. The statistical update's 26 chapters each address a unique topic linked to data on heart disease plus stroke. For the most recent information on these causes and diseases, the Statistics Update is a valuable resource for members of the general public, policymakers, media experts, clinicians, healthcare supervisors, academics, health advocates, plus others (11).

Non contrast head CT is the most initial used imaging technique for evaluating stroke. It is the best because of its superb sensitivity for hemorrhage, speedy acquisition, and wide availability. In order to detect intracranial big vessel occlusions and cervical carotid or vertebral artery disease, CT angiography (CTA), the most frequent follow-up examination following non contrast head CT, is employed (12).

The sensitivity and specificity of nonenhanced CT for depiction of ICH is estimated to be high with modern CT scanners, likely exceeding 95%– 98% depending on the patient cohort and level of training of the radiologists (13). Therefore, our main aim of study is to determine the frequency of ischemic stroke in various neurovascular regions and identify the risk factors associated with stroke occurrence in these specific neurovascular territories.

MATERIAL AND METHODOLOGY

Study Design and Setting

This was a descriptive cross-sectional study conducted in the Radiology department of Rehman Medical Institute (RMI) in Peshawar over a 4-month period

Sample Size and Technique

A sample size of 292 individuals was calculated using the formula $n = (Z^2 P (1-P)) / e^2$, with a 95% confidence level, 5% margin of error, and 74% population proportion. Non-probability convenient sampling was utilized.

Inclusion and Exclusion Criteria

The study included patients aged 40 and above presenting with ischemic stroke, while excluding hemorrhagic and hypotensive stroke patients.

Data Collection and Analysis

After obtaining ethical approval, data was collected from patient history report forms. The data was analyzed using SPSS version 22, calculating frequency, mean, median, and mode for quantitative variables, and representing qualitative variables with pie charts and bar graphs.

RESULTS

Our study involved a total of 292 patients with ischemic strokes in various neurovascular territories, in which 162 (55.5%) were male and 130 (44.5%) were female cases.

Gender	Frequency	Percentage	Cumulative Percent
Male	162	55.5	55.5
Female	130	44.5	100.0
Total	292	100.0	

The prevalence of ischemic stroke in various neurovascular territories related to age was the inclusion criteria of our study. And we took 292 patients randomly whose ages were in between 40-79 years. So, to achieve this task, we divided these stroke patients into four groups.

Group-A included all those patients aged between 40-to-49 years.

Group-B included all those patients which were aged between 50-to-59 years.

Group-C included all those patients whose ages were between 60-to-69 years.

Group-D included all those patients whose ages were between 70-to-79 years.

Table 1: Age of the Patients

Group	Age	Frequency	Percentage	Cumulative Percent
A	40-49	17	5.8	5.8
B	50-59	68	23.3	29.1
C	60-69	94	32.2	61.3
D	70-79	113	38.7	100.0
Total		292	100.0	

Two hundred and ninety-two ischemic stroke of various vascular territories cases were involved in our research. The age of these cases was between (40-79) years. In our study, we found that in Two hundred and ninety-two (292) patients, 160 (54.8%) patients were suffering from middle cerebral artery (MCA) territory, 96 (32.9%) patients were suffering from lacunar artery (LA) territory, 48 (16.4%) patients were suffering from anterior cerebral artery (ACA) territory, 39 (13.4%) patients were suffering from internal carotid artery (ICA) territory, 38 (13%) patients were suffering from Vertebero-basilar arteries (VBA) territory, 37 (12.7%) patients were suffering from watershed / border zone territory and 28(9.6%) patients were suffering from posterior cerebral artery (PCA). Figure 1 shows the "Yes" and "No" percentages of the stroke (ischemic) vascular territories of the cases.
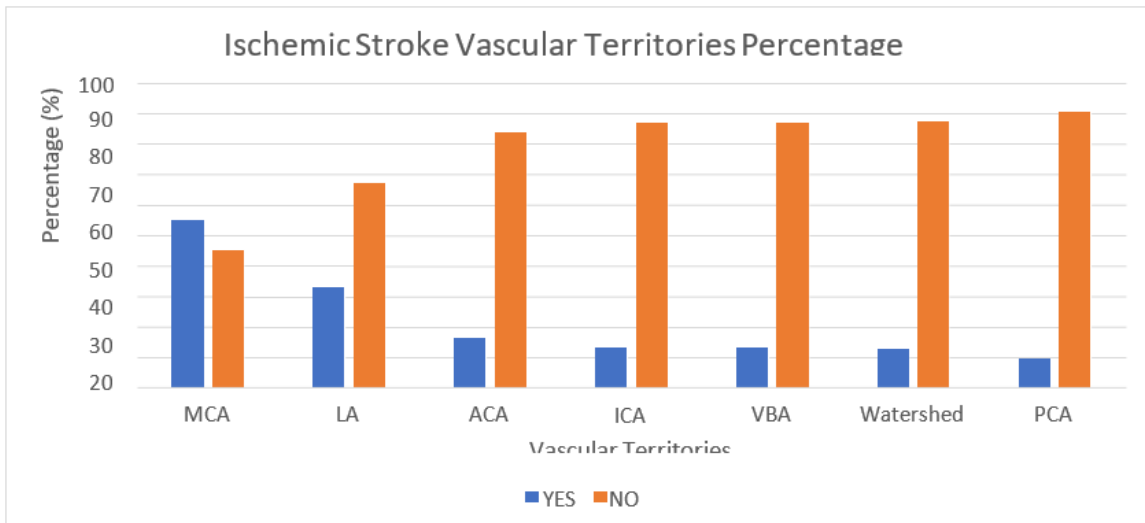

Figure 1: Ischemic Stroke Vascular Territories and its Percentage

Following the risk-factors for ischemic stroke in various neurovascular territories are Hypertension, Myocardial Infraction, Cardio embolic, Diabetic Mellitus, Migraine, Physical inactivity, Obesity, Dyslipidemia, Smoking, Atrial fibrillation, Dilated cardiomyopathy, Vulvular heart disease and ischemic heart disease are well known for ischemic stroke. During our investigation of the risk factor of ischemic stroke in various neurovascular territories, we found that out of these risk-factors, hypertension is one of the extremely prevalent risk-factor of all vascular territories of ischemic strokes. In our study, we found that out of 292 patients with ischemic stroke in various vascular territories, 202 (69.2%)

are hypertensive. The second major stroke risk factor is atrial fibrillation which are 182 (62.3%) in total of 292. Migraine is also a risk-factor for ischemic-stroke in various vascular territories. We found in our study that 135 (46.2%) patients having migraine are total of 292. The other risk factors are diabetic mellitus 106 (36.3%) patients, smoker 93 (31.8%) patients, obesity 67 (22.9%) patients, myocardial infraction 64 (21.9%) patients, cardio-embolic 56 (19.2%), ischemic heart disease 48 (16.4%) patients, dilated cardiomyopathy and dyslipidemia each 26 (8.9%) patients out of 292 patients in each of the above risk factors. And lastly, atrial valvular heart disease and physical inactivity are the minor risk factor. Only each of 17(5.8%) patients have atrial fibrillation and physical inactive out of 292.

Table 2: Risk Factors of Ischemic Stroke and its Percentage

Risk Factor	Percentage (%)		
	Yes	No	Not Available
Hypertension	69.2	27.4	3.4
Atrial Fibrilation	62.3	14.4	23.3
Migraine	46.2	24.0	29.8
Diabetes Mellitus	36.3	37.0	26.7
Smoker	31.8	19.5	48.6
Obesity	22.9	22.9	54.1
Myocardial Infarction	21.9	18.2	59.9
Cardioembolic	19.2	39.0	41.8
Ischemic Heart Disease	16.4	13.4	70.2
Dilated Cardiomyopathy	8.9	29.8	61.3
Dyslipidemia	8.9	17.1	74.0
Physical Inactivity	5.8	33.6	60.6
Valvular Heart Disease	5.8	25.0	69.2

DISCUSSION

Non contrast head CT is the most initial used imaging technique for evaluating stroke. It is the best because of its superb sensitivity for hemorrhage, speedy acquisition, and wide availability. In order to detect intracranial big vessel occlusions and cervical carotid or vertebral artery disease, CT angiography (CTA), the most frequent follow-up examination following non contrast head CT, is employed (13).

Our research was conducted at Rehman Medical Hospital, KPK, Peshawar, in which Two hundred and ninety-two ischemic stroke patients of various vascular territories were included. These patients' ages were between (40-79) years. We found that out of two hundred and ninety-two (292) patients, 160 (54.8%) patients were suffering from middle cerebral artery (MCA) territory strokes, 96 (32.9%) patients were suffering from lacunar artery (LA) territory, 48 (16.4%) patients were suffering from anterior cerebral artery (ACA) territory, 39 (13.4%) patients were suffering from internal carotid artery (ICA) territory, 38 (13%) patients were suffering from Vertebero-basilar arteries (VBA) territory, 37 (12.7%) patients were suffering from watershed / border zone territory and 28(9.6%)

patients were suffering from posterior cerebral artery (PCA) territory stroke. We found that 162 (55.5%) were male cases out of 292 and 130 (44.5%) were female cases.

We also discovered that the Prevalence of stroke increased with age because the subjects of age 60- 69 years and 70-79 years were more in number compared to other age groups. Moreover, the most common ischemic stroke risk factors as highlighted by our study were hypertension (69.2%), atrial fibrillation (62.3%), migraine (46.2%), Diabetes mellitus (36.3%), smoking (31.8%) and obesity (22.9%).

Our research findings correlate with a study by Paciaroni et al titled "Neurovascular territory involved in different etiological subtypes of ischemic stroke in the Perugia Stroke Registry" which shows the frequency of ischemic strokes in specific vascular regions shown on computed- tomography (CT) and the probable causes of stroke. A total of 1719 people were evaluated, and of those, 1284 (74.7%) declared ischemic stroke. It was discovered that the etiology of a stroke affected its location.

Most often involved (73.7%) was the MCA territory followed by lacunar infarcts, which were found mostly in the deep neurovascular territory (36.7). And the frequency of various stroke risk factors as demonstrated by Paciaroni et al was Hypertension (63.9%), Diabetes (19.4%), smoking (31.7%), Hyperlipidemia (24.2%) and Alcohol abuse (5.2%) (14).

In study titled "Comparison of Clinical Characteristics and Functional Outcomes of Ischemic Stroke in Different Vascular Territories" the demographics and functional results of stroke patients who received inpatient rehabilitation from different vascular regions were compared; such a proportional data is crucial for functional prognosis, therapy, in addition with healthcare development, but literature on the subject is few plus fragmented. Utilizing data gathered prospectively across a nine-year period, 2213 people who had their first ischemic stroke were examined and referred to an inpatient stroke rehabilitation programme. Minor-vessel stroke (12.8%) and MCA stroke (50.8%) were the two most prevalent types of strokes.

Therefore, despite of the vascular area of the stroke, patients who suffered one have made meaningful functional gains afterwards should be treated. Functional results upon rehabilitation discharge are better predicted by the early functional level at entry than by the stroke subgroup (1, 16).

Another study was conducted in the Department of Medicine Unit I, Nishtar Hospital Multan in 2012 by Nargis Abid et al. observed that Approximately 85% of all ischemic strokes are brought on by a thrombotic or embolic obstruction of the cerebral arteries. In our study, the prevalence of hyperlipidemia was 37.1%. Diabetes mellitus was more common (9.6%) than hypertension (10.1%). In our environment, the prevalence of hyperlipidemia was 37.1% in individuals who had an ischemic stroke (15).

CONCLUSION

we conclude that MCA territory strokes are the most common neurovascular strokes followed by Lacunar territory strokes and ACA strokes, whereas, PCA strokes occur rarely. Furthermore, we found that the incidence of stroke increases with age, as 5.8% of patients were in the 40–49 age range. The highest percentage was seen in the age range of 70–79, followed by the 60–69 age range and then in the 50–59 age range. Our findings indicated that the primary risk factors for stroke were hypertension, atrial fibrillation, migraine and diabetes mellitus.

RECOMMENDATION

Based on our study, we recommend implementing routine screening programs to identify individuals at high risk for ischemic stroke, particularly those with hypertension, diabetes, smoking habits, obesity, and hyperlipidemia. Early detection and treatment can mitigate stroke effects or prevent its occurrence. Encouraging lifestyle changes such as regular exercise, a healthy diet, smoking cessation, and weight management is essential. Public health campaigns should focus on raising awareness and promoting healthy behaviors while enhancing efforts to manage hypertension through appropriate medication, regular monitoring, and patient education. Collaboration between individuals and healthcare professionals is crucial for improving diabetes management and reducing stroke risk. Extensive public health initiatives should aim to educate the public about ischemic stroke risk factors. Additionally, longitudinal studies are needed to evaluate outcomes and the effectiveness of preventive measures, which can inform improvements in current guidelines. By implementing these recommendations, healthcare practitioners and policymakers can enhance public health and reduce the incidence of ischemic stroke.

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