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Original Article

Evaluation of Brain Stroke by Using Computed Tomography

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ABSTRACT

A stroke is a serious emergency in the medical sector, occurring when the flow of blood to the brain is blocked or cut short. This may occur due to the bursting of a blood vessel within the brain, an ischemic stroke, or the blocking of a blood vessel in the brain (Hemorrhagic stroke). **Objectives:** To assess the demographic profiles, clinical presentations, and neuroimaging images of brain stroke patients with the help of computed tomography and name the most common type of stroke and risk factors in a Pakistani sample. **Methods:** This cross-sectional study was done in a setting of Gondal Medical Complex Hospital, Gujranwala, Pakistan, with a sample size of 60 patients who had brain CT scans after a brain stroke. 16 slices CT machine was applied in the study. **Results:** It was as per this research that there was a greater impact of brain strokes on men compared to women. The age between 71 and 90 years is the most affected age group, and the frontal lobe is the most affected site, with hypertension being the major contributor. **Conclusions:** As per the results of this study, a CT scan is an excellent diagnostic measure in the location and cause of a brain stroke. Hypertension is the primary risk factor for brain stroke.

INTRODUCTION

A stroke happens when the blood supply to a portion of the brain is cut off by a clogged or broken blood vessel [1, 2]. Both ischemic and hemorrhagic strokes also seem to be possible. A hemorrhagic stroke is caused by bleeding into the brain when a blood vessel in the brain bursts or breaks. When a blood clot or significantly narrowed artery blocks or constricts a blood vessel carrying blood to the brain, it causes an ischemic stroke [3]. One of the symptoms is a severe headache with no apparent cause, along with numbness or weakness in the face, confusion, dizziness, and difficulties with coordination [4]. One of the primary methods used to find the clot is the brain computed tomography scan, an X-ray-based diagnostic [5]. Researchers can learn more about brain diseases and/or trauma owing to a brain CT scan [6]. In the United States, 795 000 individuals are expected to suffer from stroke each year [7]. The American Heart Association views stroke as a significant problem due to its high mortality rate [8]. Between 1968 and 2016, age-adjusted stroke mortality for ages 45+ years has declined a remarkable 77% from 455.5/100 000 to 104.1/100 000 [9]. Stroke remained the third-leading cause of years-of-potential-life loss globally in 2013, with approximately 6.4 million deaths (11.8%). In 2019, there were 3.94 million (95% uncertainty interval 3.43–4.58) new stroke cases in China [10]. The total number of DALYs caused by IS, as well as the deaths arising from IS and HS, survivors, and incident events for both IS and HS, increased significantly between 1990 and 2013 [11]. Two types of strokes are prevalent in people of all ages (ischemic and hemorrhagic). Stroke patients are susceptible to having another one [12]. Stroke is one of the 10 highest contributors to Medicare costs [13], and among

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the elderly, stroke and TIA are the leading causes of hospitalization [14]. Stroke-related hospital fatalities from 2009 to 2016 accounted for 7.4% of all hospital deaths. The group of patients between the ages of 70 and 79 had the highest annual average of entries, accounting for 26% of the total, followed by those between the ages of 60 and 69 (23.7%) and those older than 80 (20.4%) [15]. Globally, the stroke incidence, stroke prevalence, deaths from stroke, and stroke-related disability-adjusted life-years (DALYs) increased by 70%, 85%, 43%, and 32%, respectively, from 1990 to 2019.

This study aimed to assess the degree of knowledge of the risk factors and symptoms of stroke among the general population and stroke survivors. To improve stroke prevention and the start of successful treatment, as well as to assess the high-risk population's understanding of stroke warning symptoms, risk factors, and therapy.

METHODS

This was a retrospective cross-sectional study conducted at Gondal Medical Complex Hospital in Gujranwala, Pakistan. Data were collected retrospectively from hospital records of patients who presented between January 28, 2022, and February 15, 2023. A consecutive sample of 60 patients was included, representing all eligible cases with complete clinical and imaging data during the 13-month study period. While a formal sample size or power calculation was not performed, a limitation acknowledged for this descriptive study, this number is consistent with sample sizes used in similar single-center, retrospective neuroimaging studies. The sample provides adequate data for a preliminary descriptive analysis of stroke type distribution and demographic patterns, though it may be underpowered for detailed subgroup comparisons. Data were collected after obtaining written informed consent from all participants, in accordance with the ethical principles outlined in the Declaration of Helsinki. Adult patients (age >18 years) were included if they had a clinical diagnosis of acute stroke by the attending neurologist, and a non-contrast CT scan of the brain confirming acute ischemic or hemorrhagic stroke. Patients were excluded if they had a transient ischemic attack (TIA) or stroke mimics (e.g., migraine, seizure, metabolic encephalopathy), incomplete medical or imaging records, prior history of stroke, or major comorbid conditions that could confound presentation or imaging findings (e.g., advanced renal failure requiring dialysis, recent cardiac arrest, or known intracranial tumor). The patients included in this study had a history of severe headache, dizziness, loss of balance, confusion, trouble speaking, etc. Patients with cardiac problems and renal failure were excluded. The slice thickness was 5mm. The brain was imaged using 64-slices Toshiba CT scanner to get images in the supine position. All patients underwent non-contrast computed tomography of the brain using a 64-slice Toshiba Aquilion scanner. The imaging protocol included axial slices with a 5 mm thickness, 120 kVp, and automated tube current modulation. All scans were independently reviewed by two certified radiologists, each with over five years of experience in neuroradiology. Discrepancies were resolved by consensus or, if needed, by a third senior radiologist. Stroke classification (ischemic vs. hemorrhagic) and localization were performed using established CT criteria, including hypodensity for acute ischemia and hyperdensity for acute hemorrhage. The inter-rater reliability for stroke type classification, assessed using Cohen's kappa, was substantial ($\kappa = 0.81$). Demographic information, medical history, and documented clinical symptoms at presentation (including headache, dizziness, focal weakness, and speech difficulties) were extracted from standardized hospital admission records. These symptoms were recorded by the attending neurologist as part of routine clinical assessment; no additional quantification scales were applied retrospectively. Informed consent was waived for this retrospective study by the ethics committee due to the use of anonymized data. Statistical analysis was performed using IBM SPSS Statistics (Version 26.0). Descriptive statistics are presented as frequencies and percentages. Associations between categorical variables were explored using cross-tabulation. Given the small sample size and low expected cell counts, formal inferential tests (e.g., Chi-square) were not applied; results are therefore presented as descriptive trends without claims of statistical significance.

RESULTS

This study included those 60 patients: 27 patients were female and 33 patients were male and according to these results brain stroke was more common in male than in female (Figure 1).

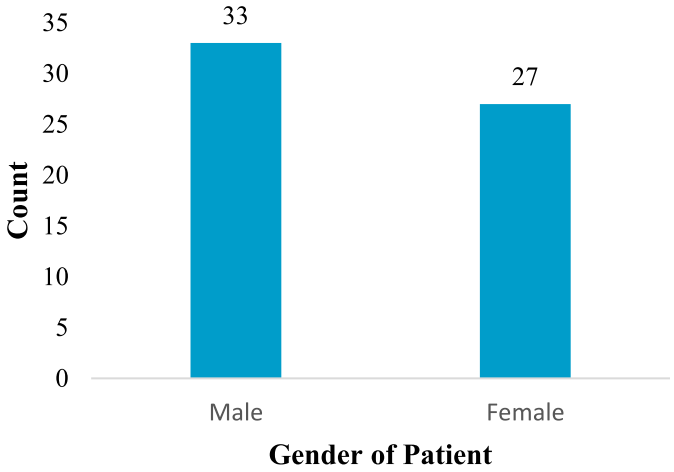

Figure 1: Frequency Distribution of Gender

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Findings show about the types of brain stroke in which ischemic stroke (50) is more common than hemorrhagic stroke(10)(Figure 2).

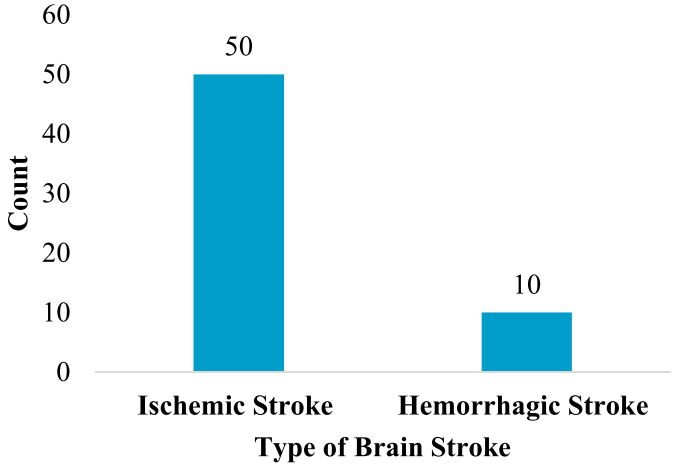

Figure 2: Frequency Distribution of Types of Strokes (Ischemic, Hemorrhagic)

The study crosstabulation between Gender of patients*Types of brain strokes shows that 26 male had ischemic stroke and 7 had hemorrhagic stroke whereas 24 female had ischemic stroke and 3 had hemorrhagic stroke (Table 1).

Table 1: The Crosstabulation Between Gender of Patients*Types of Brain Strokes

Gender of Patients	Types of Brain Stroke		Total
	Ischemic	Hemorrhage	
Male	26	7	33
Female	24	3	27
Total	50	10	60

Crosstabulation between symptoms of stroke patients *Types of brain stroke show that hypertension is a major cause of brain stroke(Table 2).

Table 2: The Crosstabulation Between Symptoms of Stroke of Patients and Types of Brain Strokes

Symptoms of Stroke Patients, Types of Brain Stroke Crosstabulation	Types of Brain Stroke		Total
	Ischemic	Hemorrhage	
Hypertension	18	3	21
Left Side Weakness	5	1	6
Headache	2	0	2
Seizures	2	0	2
Cva	4	0	4
Diabetes	5	0	5
Left Hemiplegia	1	0	1
Loss of Consciousness	2	2	4
Rta	0	1	1
Fall From Height	0	1	1
Vertigo	1	0	1
Right Side Facial Weakness	1	0	1
Dementia	3	0	3
Pain In Left Temporal	1	0	1
Confusion	1	0	1
Generalized Weakness	1	0	1
Left Hemiparesis	1	0	1
Ischemic Heart Disease	1	0	1
No History	1	2	3
Total	50	10	60

DISCUSSION

A retrospective study on 60 stroke patients that were assessed using computed tomography (CT) showed a number of interesting trends in terms of the distribution of stroke types, risk factors, and demographic factors involving our health facility. The fact that ischemic stroke is more common than hemorrhagic stroke, that hypertension is strongly linked with it, and the fact that it is disproportionately common among the female population and in older individuals, is an important piece of evidence that should be further analyzed within the framework of the already available literature. This result that ischemic strokes occurred in 83.3 percent of the infections is consistent with the data from the world, the ischemic strokes make up about 70-85 percent of all strokes [16]. This trend can be attributed to the increased prevalence of atherosclerosis, cardioembolic disease, and small vessel pathology, all of which are predisposing factors to ischemic and not hemorrhagic events. Hypertension was the most commonly reported clinical factor in this cohort (35.0%), which is in line with its proven status as the number one modifiable risk factor that causes stroke [17]. Hypertension is a risk factor in the pathogenesis of stroke by affecting the pathogenesis in many ways, such as endothelial dysfunction, arterial remodelling, and elevated cerebral perfusion pressure, which can cause ischemic(via large artery atherosclerosis or via lacunar infarction) and haemorrhagic strokes (via rupture of Charcot-Bouchard aneurysms) [18]. Present sample has shown that hypertension is very common among people, which highlights the importance of proper blood pressure screening and management in stroke prevention programs. In our cohort, the prevailing number of male patients (55% patients) was noted; this has been seen in several stroke registries across the world [19]. This gender disparity might be attributed to a number of related factors. At a biological level, premenopausal women possess the advantage of protection of estrogen against vascular endothelial activity and lipid metabolism [20]. Behaviorally, men in our area can be more exposed to the classic stroke risk factors, such as smoking, work-related stress, and a worse healthcare-seeking pattern towards non-symptomatic high blood pressure. This disparity may also be increased by socioeconomic factors such as increased rates of outdoor jobs and disparities in health literacy [21]. It is important to mention, though, that,

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although the incidence of strokes is greater in men, women tend to have poorer functional outcomes and more severe strokes, perhaps because they have strokes in later life and tend to have more comorbidities [22]. The prevalence of cases accumulated in the 71–90 year age category is the result of the accumulation of the vascular aging process and long-term exposure to the risk factors. Physiological alterations also relate to aging, and they make the stroke more vulnerable, such as stiffening of the arteries, decreased cerebrovascular responsiveness, and failure of the collateral circulation [23]. Moreover, elderly people tend to possess several comorbidities (atrial fibrillation, diabetes, chronic kidney disease, etc.) that tend to interact to increase the risk of stroke. This close relationship between stroke severity and advanced age may be mediated by factors that include the decreasing brain reserve, frailty, and delayed symptom recognition and hospital visits [25]. These data demonstrate the necessity of age-related prevention methods and the use of acute care plans that apply to elderly individuals.

CONCLUSIONS

This study found that non-contrast CT is an essential and reliable tool for the rapid diagnosis and differentiation of acute stroke. In this CT-based evaluation, ischemic strokes were observed more frequently than hemorrhagic strokes, and male patients and those aged 71–90 years were more commonly represented in the cohort. Hypertension was identified as the most common associated clinical condition.

Authors Contribution

Conceptualization: AA
Methodology: AA, AK
Formal analysis: NT
Writing and Drafting: AA
Review and Editing: AA, AK, NT

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

The authors declare no conflict of interest.

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