



## Original Article



## Prevalence of Early Seizures in Acute Stroke Patients

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## ARTICLE INFO

**Keywords:**

Ischemic Stroke, Hemorrhagic Stroke, Seizure, Neurological Deficit

**How to Cite:**

Wali, Z. A., Azam, N., Farooq, H., Arif, M., Rafiq, U., & Zahid, M. (2024). Prevalence of Early Seizures in Acute Stroke Patients: Prevalence of Early Seizures in Acute Stroke Patients. *Pakistan Journal of Health Sciences (Lahore)*, 5(09). <https://doi.org/10.54393/pjhs.v5i09.2004>

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Received Date: 16<sup>th</sup> August, 2024

Acceptance Date: 27<sup>th</sup> September, 2024

Published Date: 30<sup>th</sup> September, 2024

## ABSTRACT

A stroke is defined as a sudden neurological deficit of cerebrovascular cause that persists beyond 24 hours. Stroke is associated with a whole spectrum of complications, especially post-stroke seizures. These seizures may adversely affect the outcome of stroke in terms of mortality and morbidity. This study was designed to find out the frequency of early post-stroke seizures. **Objective:** To determine the frequency of early-onset seizures after stroke among patients presenting to tertiary care hospitals. **Methods:** Two hundred and forty patients, presenting on the Medical floor of Jinnah Hospital Lahore with acute stroke and fulfilling the selection criteria, were approached after informed consent. The patients were followed for 14 days for the development of early seizures after the stroke. **Results:** Among 240 stroke patients, there were 123 (51.3%) male patients and 117 (48.8%) female patients. The minimum age observed was 30 years and the maximum was noted as 77 years. In 45% of patients, hemorrhagic stroke was detected and 55% of patients had ischemic stroke. From 108 cases of hemorrhagic stroke, there were 10.4% cases in which an episode of seizure occurred within 14 days of stroke. On the other hand, in 132 patients with ischemic stroke, 15.9% of patients developed seizure episodes. **Conclusions:** It was concluded that ischemic stroke was more common in frequency than hemorrhagic stroke in our population and the occurrence of episode early seizure within 14 days of stroke was more prevalent in ischemic stroke patients.

## INTRODUCTION

A stroke is a neurological emergency characterized by a sudden onset neurological deficit of cerebrovascular cause that persists beyond 24 hours [1]. Establishing an accurate diagnosis is critical in the management of stroke because sometimes neurologic symptoms cannot reliably predict the occurrence of an infarct. Noncontract computed tomography (CT) is carried out first of all as an investigation of choice in patients with suspected stroke as it has a high sensitivity for the diagnosis of acute hemorrhage. The annual incidence of stroke is about 89.13 million patients; with one-third succumbing to death and another one-third suffering from disability [2]. Age, sex, and race are important demographic variables known to affect the prevalence of stroke worldwide with men having four times more chances of developing stroke as compared to their counterparts [3]. Stroke incidence in developing countries like Pakistan and India is much higher as

compared to the developed world [4]. It is believed that this higher prevalence is secondary to higher values of stroke risk factors like hypertension, diabetes, dyslipidemias and poor socioeconomic circumstances. A recent community-based survey conducted in Pakistan suggested an estimated 1.2% prevalence of stroke [5]. Stroke-specific fatality has been reported between 11% and 30% in various studies from Pakistan with up to 63% of all stroke patients developing complications and up to 89% dependent on activities of daily living thus making it a highly debilitating disease [6, 7]. Early onset seizure frequency was reported as 8% in a local study [8]. Development of post-stroke seizure is a serious sequel of stroke and carries a high risk (>60%) of subsequent development of epilepsy especially in the first year [9]. Large areas of stroke and cortical involvement are reported to be particularly associated with post-stroke seizures [10]. Post-stroke seizures hurt stroke



outcomes in terms of mortality, morbidity and hospital stay [11]. These seizures can worsen already existing dementia [12].

This study aims to look into the frequency of early-onset seizures in various types of stroke patients in a teaching hospital and their statistical significance concerning age, gender and type of stroke.

## METHODS

It was a descriptive cross-sectional study conducted on the Medical Floor, Jinnah Hospital Lahore from 7th February 2024 till 31st May 2024 after taking hospital ethical review board (ERB) approval vide number ERB159/9/06-02-2024/S1. A total of 240 patients were included in the study by taking a 95% confidence level, 3.5% margin of error and expected percentage of early seizure among patients of ischemic stroke as 8% (least among all factors) [8]. Non-probability consecutive sampling was done. It included patients of both sexes, between 30 to 80 years of acute stroke determined by clinical features and confirmatory CT scan (as per operational definition). Patients with a previous history of ischemic or hemorrhagic stroke, seizure and epilepsy, metabolic disturbance (determined by abnormalities in serum electrolytes, blood sugar level, renal function test and acid-base disorders) or brain tumor (determined by CT Scan) were excluded from the study. Similarly, patients with subarachnoid hemorrhage, arteriovenous malformations or subdural hematoma evident on CT scan were not enrolled in the study. An informed consent was taken from their family and patients' baseline data were taken. Data confidentiality was maintained. The patients were followed for 14 days for development of early seizure after stroke and all the information was recorded in the questionnaire. Data were entered and analyzed using SPSS version 23.0. Quantitative variable i.e. age was summarized as mean and standard deviation. Nominal variables like sex, type of stroke and development of early onset seizure following stroke (outcome variable) were presented as frequency tables and percentages. Data were stratified for age, gender and type of stroke (ischemic and hemorrhagic). Post-stratification chi-square test was applied to determine the significant difference. A p-value of <0.05 was taken as statistically significant.

## RESULTS

In our study, from the sample of 240 stroke patients, there were 123 (51.3%) male and 117 (48.8%) female. The age range was 30 to 77 years with the mean and standard deviation being  $55.17 \pm 12.02$  years. The stratification of age was also done in which three groups were defined such as 30-45 years, 46-60 years and above 60 years. There were 22.9% of patients in the first age group, 37.9% in the second age group and 39.2% patients in the third age group. It was observed that from 240 patients with stroke, there were

108 (45%) patients in which hemorrhagic stroke was detected and the rest of the 132 (55%) patients had an ischemic stroke. From one hundred and eight cases of hemorrhagic stroke, there were 10.4% cases in which an episode of seizure occurred within 14 days of stroke. On the other hand, from 132 patients with ischemic stroke, 15.9% of patients developed episodes of seizure within 14 days of stroke (Table 1).

**Table 1:** Cross-tabulation of Type of Stroke and Early Seizure Following Stroke

Type of Stroke	The episode of Early Seizure Following Stroke Within 14 Days		Total
	Yes	No	
Hemorrhagic	13	95	108
Ischemic	21	111	132
Total	34	206	240

$\chi^2=0.732$ , DF=1, p-value=0.392

There was no significant difference was found for stratified age, gender and type of stroke on early episodes of seizure (p=0.45, 0.83 and 0.39 respectively) (Table 2).

**Table 2:** Cross-tabulation of Age and Early Seizure Following Stroke

Age Group	The episode of Early Seizure Following Stroke Within 14 Days		Total
	Yes	No	
30-45 years	5	50	55
46-60 years	15	76	91
Above 60 years	14	80	94
Total	34	206	240

$\chi^2=1.61$ , DF=2, p-value=0.448

The chi-square test was also applied to find significant differences for stratified age, gender and type of stroke for early episodes of seizure (Table 3).

**Table 3:** Cross-tabulation of Gender and Early Seizure Following Stroke

Gender	An Episode of Early Seizure Following Stroke Within 14 Days		Total
	Yes	No	
Male	18	105	123
Female	16	101	117
Total	34	206	240

$\chi^2=0.045$ , DF=1, p-value=0.831

## DISCUSSION

This study revealed that ischemic stroke was more frequent in occurrence than hemorrhagic stroke in our local setup (55% vs. 45%). It was comparable to a study conducted by Khealani *et al.*, in which 72% of the patients had ischemic stroke and one hundred seventeen (8%) cases were having episodes of early seizures after stroke [8]. Stroke frequency was slightly higher (51.3%) in male patients in our study than in female patients (48.8%) and stroke occurrence was highest (39.2%) in patients with age > 60 years. In our study, episode of early seizure within 14 days of stroke was greater than reported in Khealani *et al.*,

study, especially in ischemic lesions (15.9% vs. 10.4%). The frequency of post-stroke seizures was described as around 2.8% in another study including 138 patients of stroke whereas patients with seizures had increased mortality at one month (36.2% vs. 16.8%,  $p < 0.0001$ ) and 1-year post-stroke (48.6% vs. 27.7%,  $p < 0.001$ ), prolonged hospital stay and marked dependency ( $p < 0.001$ ) later on [13]. Our study findings were of even higher post-stroke seizure frequency, however, it was not designed to explore further post-seizure sequel. De *et al.*, reported that late-onset seizures after stroke were more commonly associated with future epilepsy [14]. In contrary to our findings, DeHerdtV *et al.*, stated that the occurrence of seizures was more closely related (14%) to intracerebral haemorrhages [15]. Nevertheless, it was equivocally witnessed that early-onset seizures had a guarded prognosis with a high in-hospital mortality rate, especially in hemorrhagic strokes. Incidence of status epilepticus was also reported by Wang *et al.*, (6.9 per 1000 stroke) in stroke patients [16]. Our study didn't find any significant impact of age, gender and type of stroke on the occurrence of early episodes of seizure. ( $p = 0.45, 0.83$  and  $0.39$  respectively). A study was conducted by Chen *et al.*, in which at the molecular level, early onset epileptic seizure was described to be associated with dysfunction of the sodium-potassium pump and marked glutamate release secondary to ischemic and hypoxic insult [17]. A study conducted by Kilpatrick *et al.*, concluded that early-onset seizures after stroke carried a significant risk of subsequent recurrence in later life regardless of the type or location of stroke [18]. However, in a study Lin *et al.*, severe neurological deficit at the onset of stroke was reported to be more strongly associated with post-stroke epilepsy [19]. Short-term therapy with anti-epileptic drugs, for secondary prophylaxis of seizures after stroke, was found associated with improved quality of life according to Freiman *et al.*, [20]. Our research highlighted important statistics about the stroke burden in the Pakistani population and stroke-associated seizures. Ischemic stroke accounts for a major portion of stroke patients in our population and post-stroke seizures have a worse effect on stroke outcomes. There were a few limitations of this study as well like it was a single-center study and it assessed only seizure frequency in stroke patients. Multicenter and prospective studies are needed to truly find out the incidence of post-stroke seizures and their impact on stroke outcomes.

## CONCLUSIONS

It was concluded that ischemic stroke was more common in frequency than hemorrhagic stroke in our population and the occurrence of episode early seizure within 14 days of stroke was more prevalent in ischemic stroke patients. Ischemic stroke accounted for a major portion of stroke patients in our population and post-stroke seizures have a worse effect on stroke outcomes.

## Authors Contribution

Conceptualization: ZAW

Methodology: HF, MA, UR,

Formal analysis: ZJ

Writing review and editing: NA, ZJ

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

## Conflicts of Interest

The authors declare no conflict of interest.

## Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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