



Original Article



Association of Age and Gender with Early Onset Seizures in Patients of Acute Ischemic Stroke at a Tertiary Care Setting

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ABSTRACT

The prevalence of ischemic stroke is more in south Asian countries. Individuals having an early seizure have a significantly elevated chance of developing epilepsy after stroke than individuals having stroke but no early seizure. The seizures that occur following the stroke has been observed as contributing to more worse outcomes and disabilities. **Objective:** To determine the association of age and gender with earliest inception seizures in sufferers of acute ischemic stroke at a tertiary care setting in Sindh Pakistan. **Methods:** This cross sectional study was organized at Department of Medicine of Bilawal Medical College Hospital, Kotri from 26 May 2023 to 26 October 2023. In this study, the patients attending Bilawal Medical College Hospital reporting with stroke were recruited for this research study. The presence or absence of earliest seizures is dependent variable while, the age, gender and sociodemographic status are variables in present study. The data were analyzed on International Business Machine Statistical Package for Social Sciences Version 26.0. **Results:** Out of 118 stroke patients, 17 (14.4%) found with early seizures. The gender and age appeared to have significant association with early onset of seizures with p value 0.01 and 0.04 correspondingly. **Conclusions:** It was concluded that male patients and all patients aged between 51 to 60 years were more likely to experience an early seizure. After an acute stroke, earliest seizures could not resemble to unfavorable functional prognosis.

INTRODUCTION

The prevalence of seizures following stroke has been reported as increasing globally and it relies on the type of stroke. In recent eras, post-stroke seizures have been getting more attention from health professionals, as it is difficult to manage leading to more disabilities and worsening the quality of life. The neurotransmitters, ion channel dysfunctions, and genetic variations play a role in the development of early post-stroke seizures [1]. Early post-stroke seizures are those that occur up to seven days following the stroke's beginning. Individuals having an early seizure have a significantly elevated chance of developing epilepsy after stroke than individuals having stroke but no early seizure [2]. The seizures that occur following the

stroke have been observed as contributing to worse outcomes, long stays in hospitals, impaired quality of life, and disabilities. Proper management strategies are crucial for decreasing the worse outcomes expected to be developed in post-seizure patients [3]. The mortality, as well as the morbidities related to post-stroke seizures, has declined in well-developed countries. This might be because of recent advances in management strategies for ischemic stroke [4]. But it has been seen that the prevalence of ischemic stroke is higher in South Asians as compared to Europeans, and the underlying mechanisms are not clear. South Asians living in the United Kingdom have been observed as more prone to develop comorbid



conditions e.g., post-stroke seizures [5]. Intracerebral hemorrhage, ethnicity, male gender, dyslipidemia, and small vessel occlusion have been reported as the risk factors for early-onset seizures in patients of ischemic stroke but there is controversy about age and gender, whether they contribute to the earlier development of seizures in post-ischemic stroke patients [6, 7].

Acute ischemic stroke is a major neurological burden in South Asian populations, and early-onset post-stroke seizures significantly worsen patient outcomes through increased disability, prolonged hospitalization, and elevated risk of post-stroke epilepsy. Although several studies have identified clinical predictors of post-stroke seizures, the specific influence of age and gender remains controversial, with inconsistent findings across different populations and limited evidence from Pakistan. This research gap restricts context-specific understanding of demographic risk factors in tertiary care settings. Therefore, this study aimed to determine the association of age and gender with early-onset seizures among acute ischemic stroke patients in a tertiary care hospital in Sindh, Pakistan, to identify vulnerable groups and strengthen evidence for improved clinical monitoring and preventive strategies.

METHODS

A cross sectional study was organized at Department of Medicine of Bilawal Medical College Hospital Kotri from 26 May 2023 to 26 October 2023. The ethical approval of research project was taken with reference number (BMC/Principal/-2024/1525). (In this study, total 118 patients (n=118) of ischemic stroke were recruited matching selection criteria. The sampling techniques was non probability purposive sampling. Though, known individuals of epilepsy, patients with brain injury after trauma, patients with electrolyte imbalance, transient ischemic attacks, Meningioma, Bacterial, tuberculosis, viral, or TB Meningitis, hepatic encephalopathy and patients having Glasgow Coma Scale less than 7 were excluded. The data were collected at the bedside after taking informed consent and the structured questionnaire was filled by the researcher to record sociodemographic factors, age, gender, body mass index, socioeconomic status and history was taken regarding event of stroke, its duration and time interval from the patients attendants with the help of patients file maintained at the hospital. The presence or absence of early seizures was the dependent variable in the study, age, gender and sociodemographic status were the independent variables in the study. The post-stroke seizures were classified as acute/ early onset seizures if occurring within one week of stroke onset and late seizures, if occurring after one week of stroke onset. The types of post stroke seizures were determined, on the basis of history from patient's attendants and the clinical

observations, documented by attending physicians. All patients were monitored in ward till the end of 14th post stroke day. Sample size was calculated on software Open Epi. According to a study carried at LUMHS hospital in 2016 by Qazi TR et al., reported the prevalence of early onset post stroke seizures as 7.1% [8]. Taking the $p=7.1$, with 5% margin of error and 95% confidence interval, the calculated sample size was 102. In the time frame of study period, 118 patients meeting the selection criteria, were admitted in the ward, so 118 patients (n=118) recruited for this study, and this may increase the precision of this study. IBM SPSS version 26.0 was used to enter and analyze the data. Numerical data were revealed in descriptive statistics utilizing mean and standard deviation while the categorical data were presented in frequency and percentages. Chi Square test was used to evaluate the association of dependent variable with independent variables.

RESULTS

The mean age of study subjects was 52.47 ± 7.12 years with minimum age 39 to max age 71 years. The mean difference of the time between event of stroke and seizures was 55.45 ± 11.9 hours with minimum 41.6 hours to maximum 120.5 hours. The mean duration of seizures was 4.16 ± 2.09 minutes table 1.

Table 1: Descriptive Statistics of the Study Participants

Descriptive Statistics	Min	Max	Mean \pm SD
Age (Years)	39	71	52.47 ± 7.12
Duration of Seizures (in Minutes)	2.4	5.2	4.16 ± 2.09
BMI Kg/m ²	24.1	33.4	27.1 ± 2.8
Interval between Event of Stroke and Seizures (Hours)	41.6	120.5	55.45 ± 11.9

In this study out of 118 patients, 17 (14.4%) reported with early seizures (Figure 1).

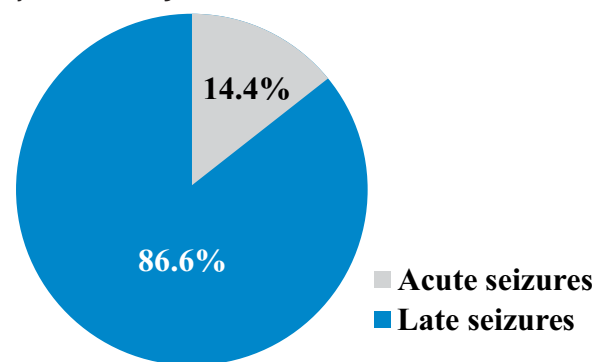


Figure 1: Early/ Acute Onset Seizures among the Patients of Ischemic Stroke

In this study, there were 53.39% male and 46.61% female patients. Majority of the patients were aged between 51 to 60 years. The most (51.69%) of the patients belonged to average socioeconomic status (Table 2).

Table 2: Sociodemographic Factors of Study Participants (n=118)

Variables	Frequency (%)
Gender	
Male	63 (53.39%)
Female	55 (46.61%)
Age (in Years)	
18 to 30	3 (2.54%)
31 to 40	4 (3.39%)
41 to 50	17 (14.41%)
51 to 60	51 (43.22%)
61 to 70	27 (22.88%)
More than 70	16 (13.56%)
Socio-economic Status	
Low	38 (32.20%)
Average	61 (51.69%)
High	19 (16.10%)

A higher proportion of male patients, elderly patients aged between 51 to 60 years, socioeconomically challenged (both average and low) patients reported greater tendency to develop early seizures after stroke. In current study, gender and age appeared to have significant association with early onset of seizures with p-value 0.01 and 0.04 respectively, as shown in Table 3. While there is statistically significant difference of seizure occurrence based on age and gender, but the effect size was weak for both age and gender, i.e., $V=0.12$ (0.1 to 0.3 is small effect) for gender and $v=0.05$ (very small effect). Therefore, there is statistically significant effect of age and gender on early onset of seizures but considering the effect size, age and gender alone are not strong predictors of early onset seizures, but other factors might contribute. When absolute risk was calculated there was 19.19 % more risk of early onset seizures in males (0.19; 95% CI 0.09-0.28) For age group 51-60 years, the risk of early onset seizures was 17.65% (0.1765; 95% CI 0.07-0.28).

Table 3: Chi Square Association of Early Seizures with Study Variables

Study Variables	Early Onset Seizures			p-value
	Total	Yes	No	
	Frequency (%)	Frequency (%)	Frequency (%)	
Gender				
Male	63 (53.39%)	12 (19.05%)	51 (80.95%)	0.01*
Female	55 (46.61%)	5 (9.09%)	50 (90.91%)	
Age (Years)				
18 to 30	3 (2.54%)	0 (0.00%)	3 (100.0%)	0.04*
31 to 40	4 (3.39%)	0 (0.00%)	4 (100.0%)	
41 to 50	17 (14.41%)	2 (11.76%)	15 (88.24%)	
51 to 60	51 (43.22%)	9 (17.65%)	43 (84.31%)	
61 to 70	27 (22.8%)	4 (14.81%)	23 (85.19%)	
More than 70	16 (13.5%)	2 (12.50%)	14 (87.50%)	
Socio-Economic Status				
Low	38 (32.20%)	6 (15.79%)	32 (84.21%)	0.08
Average	61 (51.69%)	9 (14.75%)	52 (85.25%)	

High	19 (16.10%)	2 (10.53%)	17 (89.47%)	
*Significant Statistically (p-value<0.05)				

DISCUSSION

In the present study, 14.4% of patients reported post-stroke early seizures. The frequency of early seizures was higher in these findings compared to a study conducted in 2016, which reported that 11(7.1%) individuals with ischemic stroke experienced early seizures [8]. The mean age of the study subjects was 52.47 ± 7.12 years, ranging from 39 to 71 years. Qazi TR et al., reported a nearly similar mean age in their study [8, 9]. Most of the patients were aged between 51 and 60 years. The age distribution in the present study was in line with the age group distribution reported by Qazi TR et al., [8]. The mean duration of seizures was 4.16 ± 2.09 minutes, which was comparatively higher than the durations reported in a previous study on early seizures among ischemic stroke patients [8]. In this study, 53.39% of the patients were male and 46.61% were female. The Chi-square test revealed a statistically significant difference in seizure occurrence related to gender ($p < 0.05$). These findings were in agreement with the research of Kim HJ et al., who also reported that gender was associated with the occurrence of early seizures [9]. However, in contrast, Mohamed AT et al., and Burneo JG et al., did not observe any significant gender-based differences [10, 11]. Additionally, while the current study found a higher proportion of early seizures in males, a meta-analysis reported that females had higher odds of developing early seizures [12]. Most of the patients were between 51 and 60 years of age. It was observed that age was significantly associated with the occurrence of early seizures. Thomas R reported that early onset post-stroke seizures were more prevalent in younger age groups, which contrasted with the findings of the present study [13]. This study also differed from the findings of Mohamed C et al [14]. However, the findings of Xu MY et al., were similar to those of the current study, as they reported that experiencing a stroke before the age of 65 was a risk factor for developing early seizures [15]. Carroll K et al., also supported the findings of this study, highlighting age as a significant predictor of early-onset seizures in post-stroke patients [16]. According to their research, gender was not significantly related to post-stroke early seizures. In similarity with the present study, Alsaad F et al., revealed that both age and gender were significant predictors of early-onset seizures in stroke patients [17]. This study found that males had a 19.19% higher risk of early onset seizures (0.19; 95% CI: 0.09-0.28) and older patients had a 17.65% increased risk (0.1765; 95% CI: 0.07-0.28). Thomas R and Shariff E et al., also reported a higher proportion of male patients developing early onset seizures in acute stroke [13, 18]. No significant association was found between early seizures and socioeconomic status in this study. This was supported by Wali Z et al., who also reported no significant effect of socioeconomic status on the development of early seizures in stroke

patients [19].

However, Nguyen M et al., found that socioeconomic status might influence poor functional recovery in acute stroke patients [20]. The results of this study indicated that age and gender played important roles in post-stroke early seizures. Despite these findings, the study had limitations, including a small sample size and its single-center design. Future multi-center studies with larger sample sizes are recommended to validate these relationships, explore potential underlying mechanisms, and investigate environmental and genetic factors contributing to early seizures in stroke patients.

CONCLUSIONS

A close examination of the clinical features of earliest-onset stroke seizures, it was determined that male patients and all patients aged between 51 to 60 were more likely to experience an early seizure. After an acute stroke, early seizures did not appear to be related to a worse functional prognosis.

Authors' Contribution

Conceptualization: RK

Methodology: AA, KKP, AAN, KA

Formal analysis: RKS

Writing and Drafting: RK, AA, RKS, KKP, AAN, KA

Review and Editing: RK, AA, RKS, KKP, AAN, KA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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