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Original Article

Incidence and Predictors of Acute Symptomatic Seizures after Stroke at a Tertiary Care Hospital

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ABSTRACT

Neurological deterioration can occur in approximately 15% of patients with acute stroke. Several mechanisms can lead to ischemic lesion extension and subsequent neurological worsening, including re-occlusion, edema progression, and cardiovascular instability. Stroke is one of the main causes of morbidity and mortality worldwide. **Objective:** To determine the Incidence and predictors of acute symptomatic seizures after stroke at a tertiary care hospital. **Methods:** This Descriptive Cross-Sectional Study was conducted at Department of Neurology, Civil Hospital, Karachi, Pakistan, from April 19, 2019 to October 18, 2019. Informed consent from all the patients who fulfilled the inclusion criteria was taken after explaining the procedure, risks and benefits of the study. CT scan & continuous twelve-lead ECG were performed. Assessment for associated factors of ischemic stroke i.e., seizure, atrial fibrillation and family history of stroke were noted. All the collected data were entered into the proforma attached at the end and used electronically for research purpose. **Results:** Mean ± SD of age was found to be 63.14±16.7 years. Out of 251 patients, 137(54.6%) patients were male and 114(45.4%) were female. Diabetes Mellitus was noted in 97 (38.6%) patients. Factors associated with acute ischemic stroke i.e., seizure was noted in 31 (12.1%) while atrial fibrillation was noted in 68 (27.1%) patients and positive family history of stroke was documented in 46 (18.3%). **Conclusions:** It is to be concluded that atrial fibrillation was found to be the major modifiable associated factors in the development of stroke. Controlling of these risk factors might reduce the risk of stroke.

INTRODUCTION

Stroke is the second leading cause of death globally. Being responsible for five and half million deaths annually [1] with many more suffering from a high degree of stroke associated morbidity. Stroke is also, a known epileptogenic condition and one of the most frequent causes of acute symptomatic seizure and epilepsy in adults [2]. The incidence of seizure after the stroke has been reported to varying range from 2% to 67% [3]. Stroke increase the risk of seizure by several folds and the reported relative's risk of developing seizure after stroke as compared to general population as high as 35 times [4]. The relationship between seizure and stroke, despite being recognized more than a century ago by John Hughling Jackson [5] is yet to be fully understood. Post-stroke seizure can occur soon after the onset of ischemia or can be delayed. Acute symptomatic seizure following a stroke are thought to result from cellular biochemical dysfunction leading to electrically irritable tissue [6]. Acute ischemia leads to increased extracellular concentration of glutamate, an excitatory neurotransmitter that has been associated with secondary neuronal injury recurrent epileptiform-type neuronal discharge can occur in neural networks of

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surviving neutrons exposed to glutamate [7, 8]. In addition, transient peri-infract depolarization's have been observed in the penumbra after the experimental occlusion of the middle cerebral artery [9]. There is a correlation between the number and total duration of depolarized events and infract volume in the setting of ischemia, perhaps due to reductions in capillary perfusion leading to more profound ischemia in penumbral tissue. Experimental data also suggest that epileptogenesis is enhanced by hyperglycemia at time of ischemia [10]. Acute symptomatic seizure following stroke may have a negative impact on outcome of stroke. Acute symptomatic seizure is thought to be associated with a high risk of status epilepticus and an increased death rate [11]. Some investigators even observed that seizure in post stroke period are independent predictors of mortality in acute stroke. Thus, it is important to be able to know beforehand whether a strike shall result in acute symptomatic seizure by identifying reliable predictors so as to be able to employ early and effective measures (including but not limited to prophylactic anti-epileptic medication) to control them and limit the probable damage that they may cause. Cortical location of stroke and stroke severity and reported, consistently, to be independent predictors of post stroke seizure [12]. Factors associated with acute ischemic stroke reported by different studies i.e., seizures (7.2%), atrial fibrillation (25%) and family history of stroke (12%) [13, 14]. Other probable factors include (but not limited to) male gender, age greater than 65 years, [15] anterior circulation infraction, [16] hemorrhagic infracts, [17] cerebral venous infracts [18] and recurrent stroke [19]. There are several published reports, throughout the world, reporting associated factors of ischemic stroke but very scanty local data is available on the same. As associated factors of stroke in our local population were largely underestimated, this study was aimed to determine the Incidence and predictors of acute symptomatic seizures after stroke at a tertiary care hospital, in a metropolitan city like Karachi.

METHODS

This Descriptive Cross-Sectional Study was conducted at Department of Neurology, Civil Hospital, Karachi, Pakistan, from April 19, 2019 to October 18, 2019. 251 patients with acute ischemic stroke of both gender and age between 18 to 80 years were consecutively selected. Sample Size was calculated via W.H.O. open epi sample size calculator by taking frequency of seizures after acute ischemic stroke as 7.2% [13] with 95% and 3.2% of margin of error. Patients were chosen via non-probability consecutive sampling. Patients with transient ischaemic attack, subarachnoid hemorrhage & venous sinus thrombosis, peripheral nerve disorders like mononeuropathy and radiculopathy, Bell's palsy, vestibular neuritis and extraocular muscle imbalance due to cranial neuropathy, metabolic disorders like hyperthyroidism, hyperparathyroidism and those who were having acute myocardial infarction were excluded from the study. Informed consent from all the patients who fulfilled the inclusion criteria was taken after explaining the procedure, risks and benefits of the study. CT scan & continuous twelve-lead ECG were performed. Assessment for associated factors of ischemic stroke i.e., seizure, atrial fibrillation and family history of stroke were noted. All the collected data were entered into the proforma attached at the end and used electronically for research purpose. Data were analyzed using Microsoft Excel 2016 and SPSS version 21.0. Mean and SD were calculated for quantitative variable like age. Frequencies and percentages were calculated for categorical variables like gender, hypertension, diabetes mellitus, smoking status and associated factors of ischemic stroke i.e., seizure, atrial fibrillation family history of stroke. Data were stratified on the basis of age, gender hypertension, diabetes mellitus and smoking status to see the effect of these on associated factors.

RESULTS

Mean ± SD of age was found to be 63.14 ± 16.7 years. Post-stroke seizures were noted in 12.1% of the patients. Out of 251 patients, 137 (54.6%) patients were male and 114 (45.4%) were female. Hypertension was found to be in 158 (62.9%) patients while Diabetes Mellitus was noted in 97 (38.6%) patients. In distribution of smoking status 62 (24.4%) patients were found to be smoker (Table 1).

Table 1: Sample Description

Variable		n(%)
Gender	Male	137(54.6)
	Female	114(45.4)
Hypertension	Present	158(62.9)
	Absent	93(37.1)
Diabetes Mellitus	Present	97(38.6)
	Absent	154(61.4)
Smoking	Smoker	62(24.4)
	Non-Smoker	189(75.3)

Factors associated with acute ischemic stroke i.e., seizure was noted in 31 (12.1%) while atrial fibrillation was noted in 68 (27.1%) patients and positive family history of stroke was documented in 46 (1—8.3%) (Figure 1).

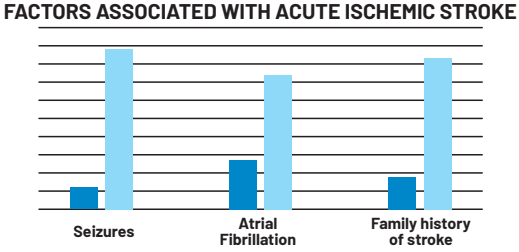

Figure 1: Factors Associated with Acute Ischemic Stroke

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DISCUSSION

Despite new post-stroke management strategies, the stroke remains a serious disease affecting not only the patient but also his family as well. Although, identifying the risk factors and modifying them remain the most important means of reducing stroke incidence. Increasing age is clearly the strongest determinant of the number of new cases of stroke each year. Among the most accepted factors associated with ES after stroke are the level of the patient's disability and hyperglycaemia. It has been shown that early seizures after stroke correlate with the volume of ischemic lesions and that the volume of ischemic lesions is larger in patients with low or normal blood pressure on admission compared to those presenting with hypertension [20, 21]. This is in accordance with our results, suggesting that lower and normal blood pressures on admission are associated with a higher risk of early seizures after stroke. Venous sinus thrombosis is a well-known epileptogenic factor [22]. In addition, recurrent ischemic strokes were also more frequently associated with seizures compared to patients presenting with first stroke. It has been previously shown and confirmed in our study that younger patients (<65 years old) more frequently suffered ES after stroke compared to older patients. It was suggested that cardio-embolic strokes are more likely to be associated with ES after stroke; however, in our subgroup analysis, no difference in ES frequency was between patients with and without atrial fibrillation. Intuitively, there is no reason to suspect that cardioembolic lesions would be more likely than emboli from large-vessel sources to cause seizures, as cardiac and large-vessel emboli frequently involve lesions to distal cortical branches. The findings of our study are comparable with other studies published locally and internationally. A few of which are discussed below in comparison to our study findings [23]. In our study the mean age of the patients assessed was found to be 63.14 ± 16.7 years. In a study conducted by Hundozi *et al.*, the mean age of patients was found as 69 ± 12 years [24]. A study conducted by Naylor *et al.*, reported the mean age of patients as 78 ± 11.56 years [25]. Another study conducted by Bladin *et al.*, reported the mean age of patients as 71.7 ± 13.6% years [26]. In present study, 251 patients were included, out of those, 137 (54.6%) patients were male and 114 (45.4%) were female patients. Hundozi *et al.*, in his study reported that 51.6% were male and 48.2% were female [24]. Naylor *et al.*, also reported the gender distribution in his study as 47.8% male patients and 52.2% female [25]. Bladin *et al.*, reported that 60% males and 40% females were part of the study [26]. In current study, hypertension was noted in 158 (62.9%) patients. The study of Hundozi *et al.*, stated that 68.9% patients were hypertensive [24]. The study of Bladin *et al.*, stated that 57.7% patients had hypertension [26]. In current study, diabetes mellitus was documented in 97 (38.6%) patients. A study of Hundozi *et al.*, indicated that 23% patients were diabetic [24]. In this study, positive smoking status was noted in 62 (24.4%) patients. Bladin *et al.*, also reported that 43.45% were smokers [26]. In our study, the frequency of seizure was found in 31 (12.1%) patients. In this study, atrial fibrillation was noted to be in 68 (27.1%) patients. In the study of Hundozi *et al.*, atrial fibrillation was noted 6.4% patients [24]. The study of Naylor *et al.*, found atrial fibrillation in 31.6% patients [25]. Family history of Stroke in our study was found in 46 (18.3%) patients. The prevalence of family history of stroke in Bladin *et al.*, reported to be in 3.57% patients [26].

CONCLUSIONS

It is to be concluded that atrial fibrillation was found to be the major modifiable associated factors in the development of stroke. Controlling of these risk factors might reduce the risk of stroke. Clinicians need to be vigilant to the potential occurrence of seizures in all patients with ischemic stroke, especially since post-stroke seizures appear to be relatively easily controlled with a single medication.

Authors Contribution

Conceptualization: SGA
Methodology: SJF, FH
Formal analysis: NNS
Writing-review and editing: FH, MK, SJF, IA

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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