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Etiology Profile of Acute Symptomatic Seizure in the COVID-19 Pandemic Era

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ABSTRACT

Introduction: Acute symptomatic seizures (ASS) are a type of neurological manifestation that occurs as a result of aberrant brain electrical activity triggered by intra- and extracranial stimuli. There is a shift in the clinical symptoms seen in the emergency department during this COVID-19 pandemic, which has an effect on the etiological profile of ASS.
Materials and Methods: This research used a retrospective cross-sectional design. Between July 2020 and July 2021, a total of 80 patients fulfilled the inclusion criteria. Samples were collected at Sanglah Hospital, Denpasar
Results: The data collected were 55% male (n=44) and 45% female (n=36). Patients ranged in age from 18 to 85 years, with a mean of 51 years. ASS is most prevalent in people aged 51-60 years (28,8%) and is least prevalent in those aged 18-20 years (7,5%). The worst outcome/death rate was 11,2 percent in the hypoxia, uremic, and stroke etiologic categories.
Discussion: There was a paradigm change in the etiology of ASS during the COVID-19 pandemic. ASS is more prevalent in the 51–60 year age group. Consider the pathogenesis of ASS to be inducing hypoxia.

Keywords: etiology profile, acute symptomatic seizures, seizures, COVID-19 pandemic

INTRODUCTION

Acute symptomatic seizure is also referred to as reactive seizure, seizure with provocation, and seizure associated with specific events that occur as a consequence of systemic abnormalities or are imminently likely to result in brain abnormalities. [1]

Acute symptomatic seizures are triggered by specific medical conditions or disorders that impair neuronal electrical transmission in the brain. For instance, a seizure that occurs within one week after head trauma is classified as an ASS. However, this kind of brain damage may increase the likelihood of developing epilepsy later in life.[2]

According to a research done in Rochester, Minnesota, the annual incidence of ASS was estimated to be 39/100.000 per year[3], whereas Loiseau *et al*. reported 29/100.000 persons annually.[4]Although we encounter several cases of ASS in emergency departments, there have been no studies that describe the features of ASS in Indonesia. This is important because it may help us determine what variables may contribute to ASS in patient care.

MATERIALS AND METHODS

The research used a retrospective cross sectional design, collecting samples from medical records in emergency departments and inpatient wards at Sanglah hospital between July 2020 and July 2021. All adult patients in the emergency department over the age of 18 who had their first epileptic seizure, including status epilepticus, and met the ASS criteria were included. The International League Against Epilepsy (ILAE) guidelines are used to identify seizure etiology as ASS. The research excluded those individuals having seizures that did not meet the ASS criteria. A total of 80 patients were recruited from this group.

All patients had a complete blood count, serum glucose, kidney function, inflammatory markers, and electrolytes. The thresholds that may induce seizures considered include glucose <36 mg/dL or >450 mg/dL, calcium <5 mg/dL, sodium <115 mg/dL, magnesium <0.8 mg/dL, creatinine >10 mg/dL.[1] Patients suspected of having a seizure due to a structural lesion in the brain and experiencing their first seizure should undergo head CT. After establishing the diagnosis of ASS, the patient is classified according to the cause of the seizure. Patients who die during hospitalization are considered to have had a poor outcome on the ASS.

The data is processed using SPSS 16.

RESULT

A total of 80 patients met the inclusion criteria, with males accounting for 55% (n=44) and women accounting for 45% (n=36). Patients range in age from 18 to 85 years, with an average age of 51. Acute symptomatic seizure is most prevalent among ages 51-60 years (28.8 %) and least prevalent among ages 18-20 years (%) (Table 1).

The data indicated that the most frequently encountered cause was cerebral hypoxia (20%), followed by stroke (17.5%), uremia (16.2%), hyponatremia (13.8%), hyperglycemia (10%), meningoencephalitis (8.8%), hypercreatininemia (8.8%), hypoglycemia (1.2%), and hypocalcemia (1.2%). Ten (12.5%) of the cases were the first seizure that did not have an underlying cause and was categorized as ASS but did not match the ASS criteria.

Table 1: Sample distribution by age and gender

Age (year)	Gender		Total (%)
	Male	Female	
18-20	1	5	6 (7,5)
21-30	4	5	9 (11,2)
31-40	5	5	10 (12,5)
41-50	8	6	14 (17.5)
51-60	16	7	23 (28,8)
>60	10	8	18 (22.5)
Total	**44**	**36**	**80 (100)**

Table 2: Acute symptomatic seizure etiology profile by age group

Age (year) / Etiology	18-20	21-30	31-40	41-50	51-60	>60	Total
Hypoglyceemia	-	-	-	1	-	-	1
Hyperglycemia	-	-	-	2	4	2	8
Hypocalsemia	-	-	1	-	-	-	1
Hyponatremia	-	2	2	2	4	1	11
Uremia	-	2	2	1	3	5	13
Hypercreatininemia	1	2	2	-	-	2	7
Stroke	-	-	1	3	6	5	15
Meningoencephalitis	1	1	2	-	-	3	7
Cerebral hypoxia	1	1	1	4	7	2	16
Others	3	3	-	1	1	2	10

Table3. Etiology profile of ASS based on cases and poor outcome

	Cases (%)	Poor outcome (Death)
Glucose	80 (100)	
Hypoglycemia	1 (1.2)	-
Hyperglycemia	8 (10)	3 (3.8)
Calsium	37 (46.2)	
Hypocalsemia	1 (1.2)	-
Natrium	80 (100)	
Hyponatremia	11 (13.8)	2 (2.5)
Magnesium	31 (38.8)	
Hypomagnesemia	-	-
Uremia	13 (16.2)	9 (11.2)
Hypercreatininemia	7 (8.8)	3 (3.8)
Stroke	14 (17.5)	9 (11.2)
Ischemia	11 (13.8)	7 (8.8)
Hemorrhagic	4 (5)	2 (2.5)
Meningoencephalitis	7 (8.8)	5 (6.2)
CerebralHypoxia	16 (20)	9 (11.2)
Others	10 (12.5)	2 (2.5)
Poor outcomes (Death)	36 (45)	-

Only 37 (46.2%) and 31 (38.8%) patients, respectively, had calcium and magnesium testing. There was no fall in magnesium concentration below the seizure threshold in any of the magnesium data. In certain patients, the cause of seizures may overlap with another. Uremia, cerebral hypoxia, and stroke were the leading causes of mortality, followed by meningoencephalitis, hyperglycemia, hypercreatininemia, and hyponatremia. Cerebral hypoxia is the most prevalent cause of ASS (20%) and occurs most frequently between the ages of 51-60. (Table 2) Up to 80% of overall ischemia patients with ASS have a poor outcome or death. The same proportion of patients who have a poor outcome is seen in stroke and uremia (Table 3).

DISCUSSION

The findings are quite different from those of Murthy and Yangala[5] in India, who discovered that ASS accounts for up to 23% of total seizures, with the most common etiologies being single CT enhancing lesion (SCTEL) (50%), central nervous system infection (28%), stroke (14%), tumor (7%) as well as metabolic and poisoning (2.7%). The study did not list electrolyte abnormalities as its etiology. The same result was discovered in a research done in Rochester, Minnesota by Annegers*et al*.[3] According to their study, the most common etiologies of ASS across all age groups were head trauma (16%), stroke (16%), infection (15%), and metabolic abnormalities (9%).

Rao *et al*.[6] conducted a research in India which similarly revealed different outcomes. The most often seen etiologies were neuroinfection (36%), stroke (25%), and metabolic abnormalities (12%). Neurocysticercosis is the most frequent kind of neuroinfection. The findings of this study corroborate those of Kulshrestha *et al*.[7] in India, where the most prevalent cause is neuroinfection (29.8%), namely neurocysticercosis. While both studies identify neurocysticercosis as the most common cause, this finding may be impacted by the disease's epidemiology at the time the research was undertaken. The report contradicts the study's findings, which indicate that neuroinfection (8.8%), namely meningoencephalitis, is the sixth most common cause of death, following cerebral hypoxia, stroke, uremia, hyponatremia, and hyperglycemia. However, similar to Murthy and Yangala[5] and Annegers *et al*.[3], stroke is the second ASS etiology in our research.

According to the researchers' knowledge, no similar study has been conducted in Indonesia to determine the etiology profile of ASS. Acute symptomatic seizures occur relatively often, with a frequency of up to 40% of total seizures, comparable to the frequency of febrile or epilepsy seizures.[3,8] Between July 2020 and July 2021, we discovered 80 cases. As this is the era of the COVID-19 pandemic, it is possible that this may impact the presentation of patients who come to the emergency department or even during hospitalization. Acute respiratory syndrome is one of the most frequently reported symptoms during this pandemic, prompting individuals to seek medical assistance.[9] According to our study, hypoxia is the leading cause of ASS and also the leading cause of mortality.

CONCLUSION

The most common seen ASS etiology during the COVID-19 pandemic era is cerebral hypoxia, which is particularly prevalent in susceptible ages 51-60 years and is one of the leading causes of mortality.

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