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RESEARCH

Etiology and outcome of infants and children in a tertiary hospital in the Philippines with convulsive status epilepticus

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ABSTRACT

Introduction: Among the paediatric neurological disorder, seizure ranks first. Status Epilepticus (SE) is a neurological emergency. It is associated with significant morbidity and mortality. The objectives of the presented study were to determine the clinical profile and outcome of status epilepticus in infant and children at a tertiary care hospital in Philippines. **Methodology:** It was a retrospective study conducted in Department of Pediatrics, National Children's Hospital, Quezon City, Philippines. All the patients in the age range 1 month to 18 years, admitted and diagnosed as cases of SE between January 2008 to December 2014 formed the sample size. **Results:** The seven-year average hospital based incidence of SE was 138.5 per 100,000 admissions. The most common underlying cause of SE was seizure disorder (29.89%), followed by bacterial meningitis (13.8%), and cerebral palsy (10.3%). **Conclusion:** Febrile SE is the common form of convulsive SE. There is high morbidity and mortality associated with SE.

Key Words: Convulsion, pediatric, status epilepticus

Introduction

Among the pediatric neurological disorders, seizure ranks first. At least an episode of seizure occurs in 4%–10% of children in the first 16 years of life [1]. However, the incidence rate of epilepsy is higher in the developing countries than the industrialized nations [2]. In the emergency department, seizures account for about 1% of all cases [3]. Among these, 7% have status epilepticus (SE) [3]. Pediatric convulsive SE occurs in up to 0.08% of pediatric inpatient admissions, with a mortality of up to 1% [4].

The International League Against Epilepsy recently proposed a new definition for SE. The definition has two operational dimensions. First is the duration of the seizure and the time point (t1) at which the seizure should be regarded as an abnormally prolonged seizure. The second time point (t2) corresponds to the period beyond which the ongoing seizure will result in an increased risk of long-term consequences [5]. For tonic-clonic (convulsive) SE, t1 has been found to be at 5 min while t2 is set at 30 min [5]. These data come from animal experiment models only. For other forms of SE, the time frames are yet to be defined. The same league also proposed four axes, for the classification of SE, viz a viz semiology, etiology, electroencephalogram correlates, and age. The axis 4 divides age groups into neonate, infant, childhood, adolescent and adulthood, and elderly.

SE is a neurological emergency. It is associated with significant morbidity and mortality. SE can be convulsive (CSE) or nonconvulsive. CSE is more common among the two. Age is the major determinant of the epidemiology of CSE [6]. In the Western countries, the incidence of convulsive SE among children has been reported to be between 10 and 27/100,000/year, the highest incidence being reported in children <1 year of age [7-9]. However, data from the Eastern world may reveal a different scenario. The objectives of the present study were to determine the clinical profile and outcome of SE in infants and children at a tertiary care hospital in the Philippines.

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Methodology

It was a retrospective study conducted in the Department of Pediatrics, National Children's Hospital (NCH), Quezon City, the Philippines. All the patients in the age range of 1 month to 18 years, admitted and diagnosed as cases of SE between January 2008 and December 2014, formed the sample size. A case report form (CRF) was developed and pretested for recording of data from the Medical Records Department and Laboratory. Data before entering in the CRF were edited for accuracy, completeness, and consistency. SE was defined as per the International Classification of Epileptic Seizure definition as continuous seizure activity lasting for 30 min or longer or intermittent seizure activity lasting for >30 min from which the patient does not regain consciousness. Exclusion criteria included patients in whom the duration of seizure activity could not be documented or patients whose case records had no time specification. All the patients below 1 month of age and above 18 years were also excluded. Ethical clearance was obtained from the Institutional Ethical Committee.

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Results

There were a total of 87 patients with SE admitted at the NCH from January 2008 to December 2014. There were 52 (59.8%) male and 35 (40.2%) female patients, with male-to-female ratio being 1.48. The mean age was 34.5 (±39.7) months [Table 1].

The 7-year average hospital-based incidence of SE was 138.5/100,000 admissions. It was lowest in the year 2008 and stood at 83.55/100,000 admissions, while it was maximally reported to be 251.62/100,000 admissions in 2013 [Table 2]. SE formed 0.14% of all admissions during those 7 years.

The most common underlying cause of SE was seizure disorder (29.89%), followed by bacterial meningitis (13.8%), and cerebral palsy (10.3%). Other causes are elicited in Table 3.

Table 1: Gender and age distribution of the study population

Variable	*n* (%)
Total	87 (100)
Sex	
Male	52 (59.8)
Female	35 (40.2)
Age	
Less 6 months	20 (23.0)
6 months to 1 year	10 (11.5)
1-2 years	16 (18.4)
2-3 years	9 (10.3)
3-4 years	9 (10.3)
4-5 years	5 (5.8)
5-7 years	6 (6.9)
7-9 years	4 (4.6)
9-12 years	6 (6.9)
12-15 years	2 (2.3)
≥15 years	0
Mean±SD (months)	34.5±39.7

SD: Standard deviation

Table 2: Hospital-based incidence of status epilepticus

Year	Number of cases of SE	Total admissions	Incidence (/100,000 admissions)
2008	8	9575	83.55
2009	10	9637	103.77
2010	14	10,244	136.67
2011	11	9339	117.79
2012	11	7422	148.21
2013	21	8346	251.62
2014	12	8266	145.17
Average	87	62,829	138.47

SE: Status epilepticus

Forty-three (49.4%) SE patients had initial time before anti-epileptic drugs (AEDs) at <30 min, while for 34 (39.1%) patients, AED was more than an hour [Table 4]. The mean initial time to AED was 47.4 min (±35.8 SD). The outcome of the patients is shown in Table 5.

Discussion

During the period of 6 years, 87 cases of CSE were recorded. Kravljanac et al. reported 602 convulsive SE episodes in 395 patients aged between 0.2 and 18 years from Serbia over a period of 16 years [10]. They had similar gender distribution with male-to-female ratio of 1.24, which was in contrast with our study, where males outnumbered females by a greater difference (M:F = 1.48). In a large study from the US, Kids Inpatient Database was acquired for 4 years from several thousand hospitals, revealing 12,360 cases of SE in children <20 years [4]. Females formed 44.8% of their study population. However, Chin et al. had reported absolutely equal incidence of SE among both the genders [7].

The mean age was 34.5 months, with the highest number of cases reported in age group <6 years. However, it was 6.2 years (SD 5.5) in an American study [4]. SE has been found to be more frequent in younger patients [11]. The Serbian study too reported a lower mean age of 4.3 years [10]. Barzegar and Rahbari-Banaeian found the mean age of the study population to be 46.1 ± 37.4 months (age range: 3–136 months) [12]. Even higher mean age (5.94 years) has been reported from India [13]. The first year of life was found to be the most vulnerable age group for developing SE [6]. Higher age group has also been found to be the more common age slab. The study from Taiwan showed the highest incidence of convulsive SE to be in the 1–5-year age group, with approximately two-thirds of the patients falling in <5 years' age group [14]. Age may not be a significant independent risk factor for death in SE [4].

SE formed 0.14% of all admissions in our study. SE was the reason for 0.08% pediatric inpatient admission in the US [4]. The hospital-based incidence of SE in our report stood at 138/100,000/year. In the US, Dham et al. found the highest incidence of SE to be in patients <10 years of age (14.3/100,000) [15]. They also found that the incidence of SE had increased from 3.5 to 12.5/100,000 people in all populations. Sadarangani et al. from Kenya recorded a minimum incidence of convulsive SE as 35/100,000/year in children (0–13 years) based on hospital admissions [16]. In another study from Kenya, the overall incidence rate of SE was 46 per 100,000/year and was 95 per 100,000/year in children <5 years [17]. They also found that seizure was the reason for 18.3% incident admissions with 98 cases of SE. The annual incidence of CSE in children was at 10 to 73 episodes/100,000 children and remained highest (135/100,000 to 156/100,000 children) in children younger than 2 years of age [18]. Our study revealed a comparatively higher average incidence rate based on inpatient admission. The probable reason could be that our study was restricted to children hospital only. In 2003, a large epidemiological study of SE on Japanese

Table 3: Causes of status epilepticus

Underlying cause	*n* (%)
Arnold-Chiari malformation-II S/P VPS	2 (2.30)
Bacterial meningitis	12 (13.79)
Cerebral palsy	9 (10.34)
Congenital hydrocephalus S/P VPS	3 (3.45)
Corpus callosum agenesis	1 (1.15)
Dandy-Walker syndrome S/P VPS	1 (1.15)
Febrile seizure	8 (9.20)
Grade V mixed oligoastrocytoma with necrosis right frontal lobe S/P hemicraniotomy	1 (1.15)
Hepatic failure (biliary atresia)	1 (1.15)
HIE	3 (3.45)
Hypernatremia	1 (1.15)
Hypocalcemia	1 (1.15)
Hyponatremia	1 (1.15)
Medulloblastoma S/P craniectomy	1 (1.15)
Microcephaly	5 (5.75)
Nasofrontal encephalocele	1 (1.15)
Postmeningitis hydrocephalus	1 (1.15)
Seizure disorder	26 (29.89)
Septic shock	7 (8.05)
Tuberculous meningitis II	1 (1.15)
Tuberous sclerosis	1 (1.15)

HIE: Hypoxic ischemic encephalopathy, VPS: Ventriculo-peritoneal shunt, S/P: Status post

Table 4: Initial time to antiepileptic drugs

Initial time to AED	Number of patients (%)
≤5 min	6 (6.9)
10-15 min	18 (20.7)
20-30 min	19 (21.8)
40-50 min	10 (11.5)
≥1 h	34 (39.1)

AED: Antiepileptic drug

Table 5: Outcome of status epilepticus

Outcome of SE	*n* (%)
Died	33 (37.9)
Neurological consequences	5 (5.8)
Unchanged	49 (56.3)

SE: Status epilepticus

children by ascertaining all lifetime first episodes of SE reflected an annual incidence of 38.8 per 100,000 population [19]. The highest incidence (155.1/100,000) was seen in the age range of 31 days or older to <1 year, followed by 101.5/100,000 in the age range of 1 year [19].

Seizure disorder was the most common cause for SE, accounting for about 30% of cases followed by bacterial meningitis (13.8%). Febrile seizure and cerebral palsy were the reasons for about 10% of cases each. Viral encephalitis (33%) and pyogenic meningitis (21.21%) were the leading causes of SE in a study from India [13]. Lin et al. classified the causes of SE on the basis of febrile status of the patient [14]. In the febrile group, acute central nervous system (CNS) infection was the most common cause of convulsive SE [14]. In the nonfebrile group, the most common cause was an acute non-CNS illness in a previously epileptic child [14]. In a group of 25 Japanese patients of the acute illness, eight had acute symptomatic etiologies and the remaining 17 (68%) were put into the category of febrile SE. However, CNS infection was the cause of SE in only 12.8% children in an American study [20]. There was a contrasting result for a British study, where febrile CSE was the single most common cause affecting 40% of children [6]. African nation of Kenya showed still higher percentage of children (58%) with febrile illness getting SE [21]. In a large study with data from 16 years, the most frequent etiology in the first SE was idiopathic or cryptogenic SE, followed by febrile SE [10]. In an Iranian study, the rate of preexisting seizure before status attack was 72.1% [12]. The etiology of SE differs in developed and developing nations.

SE is associated with significant morbidity and mortality. The mortality rate in our study was high at around 38%. About similar mortality rate (31.4%) was also observed by Kumar et al. [13]. The mortality and morbidity rates as reported by Barzegar and Rahbari-Banaeian were 9.3% and 9.3%, respectively [12]. Still lower mortality rate of only 1% was seen in an American study [4]. They did not find any significant difference between two genders in short-term outcome and mortality and morbidity rates. Lin et al. documented that patients with febrile illness during an acute CNS infection exhibited the worst outcomes, with 64.7% morbidity and 14.7% mortality [14]. While Nishiyama et al. from Japan did not notice a single death from SE [19]. The mortality due to SE is higher in sub-Saharan Africa than in the Western countries [21]. Case fatality rate stood at 5.1% in SE in a Serbian study [10]. The common causes of death and morbidity in SE are often due to injury from repetitive electrical discharge, systemic stress from repeated generalized tonic-clonic seizures, and damage to the CNS [22]. Long-term mortality data are variable, which range from 5.4% to 17% [6].

Conclusion

SE is more common in younger age group, especially <1 year. Male-to-female ratio shows favor towards male gender. Febrile SE is the common form of convulsive SE. There is high morbidity and mortality associated with SE.

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Competing Interests

The author declares that he has no competing interests.

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