

## Pattern of Pediatric Seizures at Al-Arish Central Hospital - North Sinai

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### **Abstract**

**Background:** Seizures represent a prevalent etiology for pediatric hospitalization, resulting in notable morbidity and mortality. Seizures are temporary manifestations arising from an atypical, heightened, or synchronized neural activity within the cerebral cortex. Approximately 2% of emergency department visits are attributed to them.

**Aim of the Study:** This study was to delineate the seizure presentation among patients admitted to the Pediatric department at Al-Arish Central Hospital in North Sinai and to contrast the findings with those of comparable studies conducted nationally and internationally. Furthermore, it provides descriptive information essential for planning future research.

**Patients and Methods:** The present study comprised a cohort of 125 pediatric patients diagnosed with seizures who were admitted to the Pediatric department at Al-Arish Central Hospital in North Sinai for one year, from June 2019 to May 2020. The age range of the individuals was from two months to eighteen years.

**Results:** The etiological analysis conducted indicated that epilepsy was the most prevalent cause of seizures in children, accounting for 45 cases (36.0%). Febrile convulsion was identified as the second most common cause, with 39 cases (31.2%) observed. Valproic acid (62.5%) and Levetiracetam (45.0%) were the prevalent antiepileptic drugs employed.

**Conclusions:** Seizure is a prevalent reason for hospitalization among children, particularly those under the age of five, at the pediatric department of Al Arish Central Hospital in North Sinai. Generalized tonic-clonic seizures are more frequent and have diverse etiologies. Epilepsy was identified as the predominant etiology for seizures, with febrile seizures following as the subsequent cause. The most prevalent types of symptomatic seizures associated with infectious causes of the central nervous system were those attributed to viral encephalitis.

**Keywords:** Seizures, Epilepsy, Children, Valproic acid, Levetiracetam, Pediatric.

## **Introduction:**

Paroxysmal episodes characterize seizures. The clinical symptoms arising from abnormal neuronal behavior and activity are transient. Episodes of abnormal involuntary movement, autonomic manifestation, or abnormal sensory phenomena describe these symptoms. The manifestations of these symptoms depend on the prominently affected part or area of the brain and may involve part or the entire body. Typically, these symptoms are accompanied by loss of consciousness and control of bowel or bladder function. Convulsions refer to seizures that exhibit significant body movement or motor manifestations, whereas non-convulsive seizures are characterized by minimal or no body movement (1).

Seizures are a prevalent factor leading to hospitalization among children, resulting in notable morbidity and mortality. Seizures are temporary manifestations arising from an atypical, disproportionate, or synchronized neural activity within the cerebral cortex (2). Approximately 2% of emergency department visits are attributed to them (3).

Seizures are most prevalent during the initial three years of age, followed by a gradual decline in frequency during the ensuing years. According to estimates, a minimum of 4-10% of children experience at least one seizure during the initial 14 years of their life (4).

The term "seizure disorder" is commonly employed to encompass a range of disorders, such as epilepsy, febrile seizures, and potentially single seizures and symptomatic seizures that arise as a result of metabolic, infectious, or other etiologies (e.g., hypocalcemia, meningitis) (2). The preponderance of evidence suggests that febrile seizures (FS) are the most frequently occurring seizure disorder in children under the age of five (5). During the occurrence of a seizure, there is an elevation in cerebral

blood flow, oxygen, and glucose consumption, as well as carbon dioxide and lactic acid production. The initial alterations in the system involve rapid heart rate, elevated blood pressure, increased blood sugar levels, and reduced oxygen levels. Transient seizures typically do not result in a permanent impact on the brain. Extended seizures, nonetheless, may result in enduring neurological impairment. The International Classification of Seizures has recently introduced a new categorization system that classifies seizures into three distinct groups: generalized onset, focal onset (previously referred to as partial seizures), and unknown onset. Generalized seizures refer to a type of seizure that involves both cerebral hemispheres and may result in an altered level of consciousness. Partial seizures arise from a discharge of seizure within a specific region or focus of the brain, and they exhibit focal symptoms that may advance to a secondarily generalized seizure. The term generalization is now exclusively reserved for primary generalized seizures, while bilateral tonic-clonic seizures are used to describe the latter (6).

## **Study Objective:**

The present study aims to characterize the seizure pattern observed in patients admitted to the Pediatric department at Al-Arish Central Hospital in North Sinai. Additionally, the study seeks to compare the findings with those reported in similar national and international studies.

## **Patients and Methods:**

Study design: A cross-sectional study conducted in a hospital setting.

Study site: Al-Arish Central Hospital in the North Sinai region.

Study period: one year (June 2019 - May 2020).

## **Patients:**

**Inclusion Criteria:** New cases from 2 months to 18 years old admitted with

seizures at the pediatric department of Al-Arish Central Hospital.

**Exclusion Criteria:**

Patients not admitted to the pediatric department, who presented to the emergency department for seizure control but refused admission and investigation, and old cases who visited the outpatient clinic to follow up only.

**Technical Design:**

A literature review of seizures in the pediatric population was conducted. The instrument utilized for gathering data: The researchers undertook the task of formulating the questionnaire. The data set encompasses sociodemographic information, as well as both current and historical medical records, familial medical history, and findings from diagnostic investigations.

A researcher collected data through personal interviews with patient care providers. These interviews were conducted at the time of patient admission.

**Statistical Analysis:**

The statistical software program (SPSS version 20) was utilized to input, modify,

and evaluate the data. The recording of specific variables is necessary. Descriptive statistics include calculating numerical measures such as frequencies and percentages for qualitative variables and quantitative data's mean and standard deviation. The Chi-square test was utilized to compare qualitative data. A significance level of less than 0.05 was used for all statistical tests to determine the significance of the p-value.

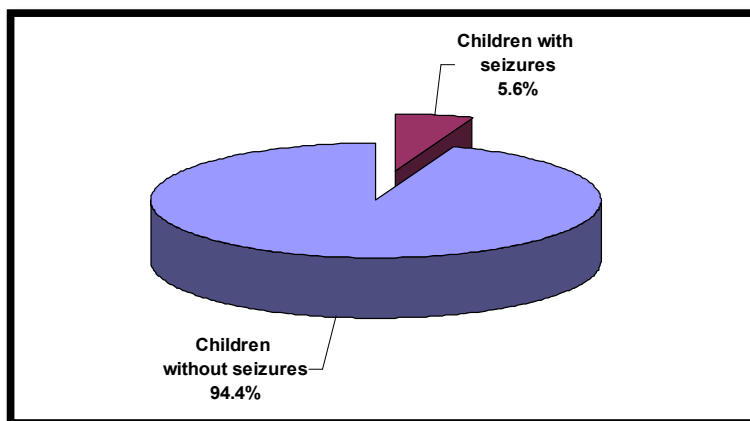
**Ethical Consideration:**

The study was approved by the Ethical Committee at the Faculty of Medicine, Assiut University, and the Ministry of Health (MOH) via Health Affairs in North Sinai. The acquisition of informed consent was secured from each participant enlisted in this investigation after elucidating the study's objectives to the participant or their caregiver. All patients were guaranteed the opportunity to participate voluntarily.

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**Results:**

**Figure (1):** The incidence of seizures in children admitted to Al-Arish Central Hospital's pediatric department in North Sinai from 2019 to 2020.



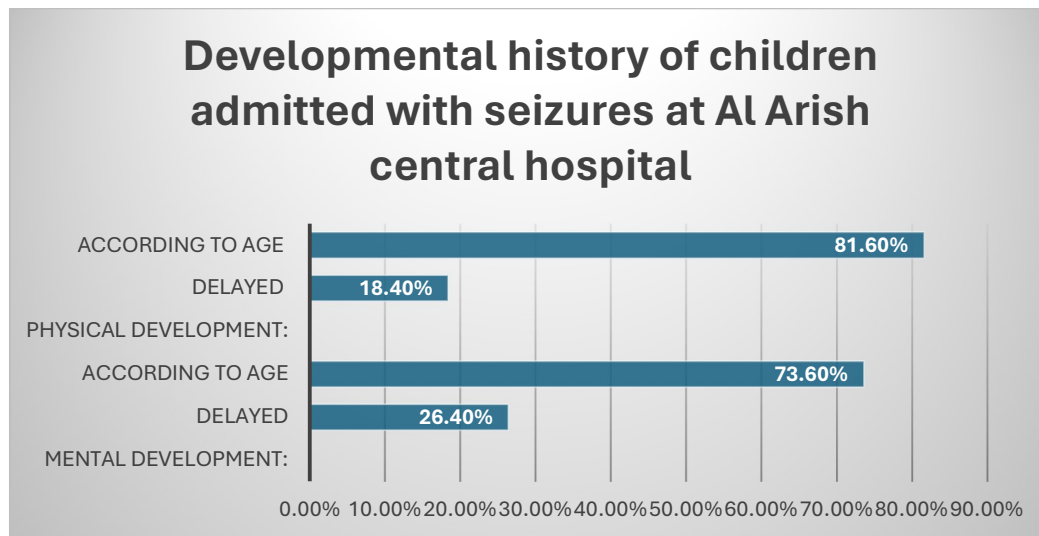
Seizures represented 5.6% of the total pediatric department admissions during the study period (125 out of 2236 cases) (Figure 1).

**Table (1)** shows the sociodemographic characteristics of children admitted with seizures at Al-Arish Central Hospital in North Sinai from 2019 to 2020.

	No. (125)	%
Age: (years)		
2 months - 1 year	29	23.2%
1 – 5Y.	66	52.8%
> 5 Y.	30	24.0%
Mean ± SD	3.61 ± 3.55	
Median (Range)	2.5 (2 months – 15 years)	
Sex:		
Male	70	56.0%
Female	55	44.0%
Parenteral consanguinity:		
Yes	39	31.2%
No	86	68.8%

Table (1) shows that more than half of the children with seizures were males (56%), in the age group 1-5 years (52.8%) with a Male: Female ratio of 1.27:1. And consanguinity was reported among 31.2% of parents.

**Figure (2):** Developmental history of children admitted with seizures, Al-Arish Central Hospital - North Sinai, 2019-2020.



Most children who exhibited seizures had physical and mental states within normal ranges, with percentages of 81.6% and 73.6%, respectively (as shown in Figure 2).

**Table (2)** shows the incidence of seizures among pediatric patients admitted to Al-Arish Central Hospital in North Sinai from 2019 to 2020.

	No. (125)	%
First convulsion or recurrent:		
First	74	59.2%
Recurrent	51	40.8%
Distribution of convulsion:		
Focal	33	26.4%
Generalized	92	73.6%
Type of attack of seizures if generalized: (n= 92)		
Tonic	57	62.0%
Tonic-colonic	26	28.3%
Absence	5	5.4%
Colonic	4	4.3%
Duration of attack:		
Short (less than 15 minutes)	109	87.2%
Prolonged (15-30 minutes)	11	8.8%
Status epilepticus (more than 30 minutes)	5	4.0%
Alteration of type of convulsion in current illness:		
Yes	17	13.6%
No	108	86.4%
Postictal manifestations:		
Yes	101	80.8%
No	24	19.2%
Type of manifestations: (n= 101)		
Sleep	54	53.5%
Stupor	44	43.6%
Hallucination	3	3.0%
Associated fever:		
Yes	76	60.8%
No	49	39.2%
Time between appearance of fever and attack: (n= 76)		
4 hours	33	43.4%
12 hours	13	17.1%
One day	8	10.5%
More than one day	22	28.9%

According to the data presented in Table 2, a majority of 59% of children had encountered their initial episode of seizures. Most seizures observed were generalized, accounting for 73.6% of cases, with 62.0% being colonic type. Status epilepticus was observed in 4% of the children who were affected. Many reported cases (80.8%) exhibited postictal manifestation, with over 50% of these instances taking the form of sleep. The prevalence of fever was observed in 60.8% of the cases.

**Table (3)** shows the type of seizures according to some patient characteristics at Al-Arish Central Hospital – North Sinai, 2019-2020

	Type of seizure				P-value
	Focal		Generalized		
	No.	%	No.	%	
Age: (years)					
< 1	14	48.3%	15	51.7%	0.003*
1 – 5	10	15.2%	56	84.8%	
> 5	9	30.0%	21	70.0%	

According to Table 3, there was a statistically significant increase in generalized seizures among children over the age of one.

**Table (4)** shows the therapeutic history of children admitted to Al-Arish Central Hospital due to seizures.

	No. (125)	%
Therapeutic history of antiepileptic:		
Yes	40	65.6%
No	85	34.4%
Number of antiepileptic drugs: (n= 40)		
Monotherapy	27	67.5%
Polytherapy	13	32.5%
Type of antiepileptic drugs: (n= 40) ≠		
Valproic acid	25	62.5%
Levetiracetam	18	45.0%
Carbamazepine	6	15.0%
Phenobarbital	4	10.0%
Lamotrigine	3	7.5%
Topiramate	3	7.5%

≠ More than one answer.

Table 4 presents data on the utilization of antiepileptic drugs in pediatric patients experiencing seizures. Valproic acid (62.5%) and Levetiracetam (45.0%) were identified as the most frequently administered antiepileptic drugs.

**Figure (4):** Provisional diagnosis of children admitted with seizures at Al-Arish Central Hospital - North Sinai, 2019-2020

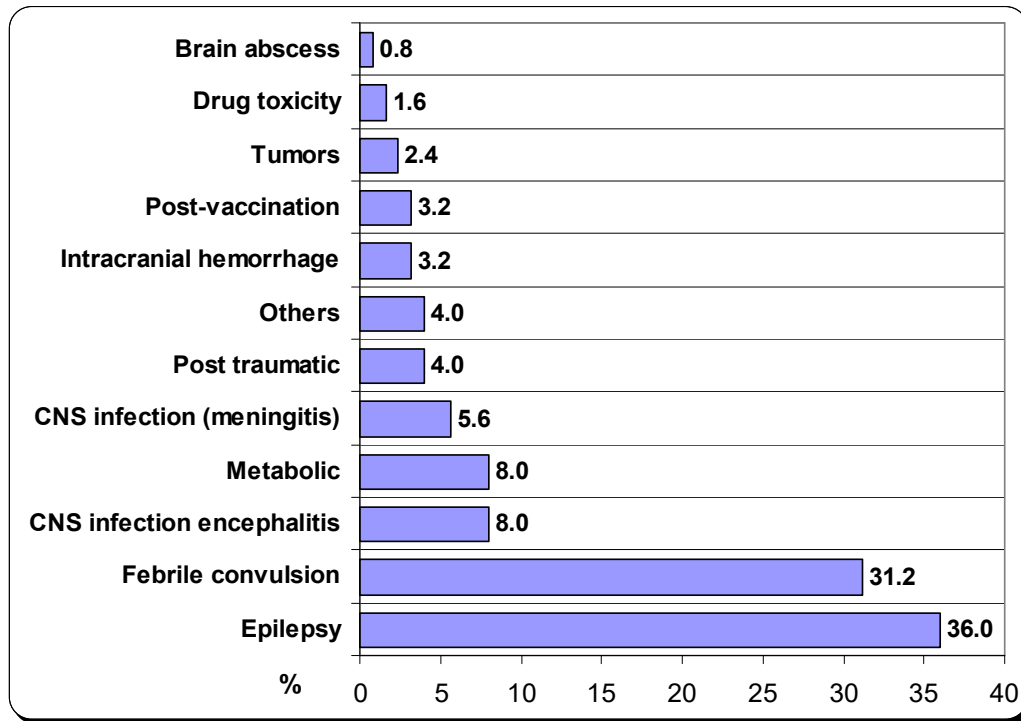


Figure (4) presents the etiological categorization of seizures after diagnosis. The findings indicate that epilepsy was the predominant etiology, accounting for 36.0% of cases, while febrile convulsion was the second most frequent cause, representing 31.2% of cases. Central nervous system (CNS) infections, namely encephalitis and meningitis, accounted for 8.0% and 5.6% of cases, respectively.

The present study found that metabolic etiologies accounted for 8% of seizure cases. Specifically, the cases included 2 instances of organic acidemia, 1 instance of pyridoxine deficiency, 2 instances of hypernatremia due to renal failure and gastroenteritis, which were further complicated by hypernatremia dehydration, and other cases of hypocalcemia. Brain tumors account for 3 cases, of which 2.4% comprise medulloblastoma.

**Table (5)** shows provisional diagnosis according to age

Differential diagnosis	Age (years)					
	< 1		1 – 5		> 5	
	No.	%	No.	%	No.	%
Febrile convulsion	5	17.2%	34	51.5%	0	0.0%
Epilepsy	5	17.2%	17	25.8%	23	76.7%
Tumors	0	0.0%	0	0.0%	3	10.0%
CNS infection (meningitis)	5	17.2%	1	1.5%	1	3.3%
CNS infection encephalitis	5	17.2%	3	4.5%	2	6.7%
Brain abscess	0	0.0%	0	0.0%	1	3.3%
Intracranial hemorrhage	2	6.9%	2	3.0%	0	0.0%
Post-traumatic	0	0.0%	5	7.6%	0	0.0%
Metabolic	4	13.8%	5	7.6%	1	3.3%
Drug toxicity	2	6.9%	0	0.0%	0	0.0%
Post-vaccination	3	10.3%	1	1.5%	0	0.0%
Others	1	3.4%	3	4.5%	1	3.3%

Table (5) showed the tentative diagnosis based on age, indicating that febrile convulsions accounted for 51.5% of cases in the 1–5-year age group. The prevalence of epilepsy was found to be highest among individuals aged over five years, accounting for 76.7% of cases, while brain tumors accounted for 10.0% of cases.

### **Discussion**

Seizures accounted for 5.6% of the overall cases that were admitted. The age group of 1-5 years exhibited the highest incidence of seizures in the current investigation. This finding is consistent with the research conducted by Dalbem *et al.* and Ramesh *et al.* (7,8). The prevalence of epilepsy in pediatric patients is most pronounced during the initial year of life. It gradually diminishes to reach adult levels by the conclusion of the tenth year of life (10). The results of our study indicate a male predominance in the sex distribution of children, with a male-to-female ratio of 1.27:1. This conforms to the findings of Ramesh *et al.* (7). Research suggests that the prevalence of epilepsy is relatively higher among males as compared to females. According to some sources, women residing in societies where they would be deemed socially marginalized or unfit for marriage may have a higher tendency to conceal their epilepsy diagnosis (9,10).

The study findings indicate that a significant proportion of children experienced generalized seizures, with the most prevalent type being generalized tonic seizures, followed by tonic clonic seizures. Additionally, approximately one-quarter of the children experienced focal seizures. These findings are consistent with the outcomes documented by Ramesh *et al.* (7) and Mamillapalli *et al.* (11), with a prevalence rate of over 25% of developmental delay observed in the cohort of children under investigation.

The study conducted by Mamillapalli *et al.* (11) revealed that the developmental history of the majority of cases (95%) was normal, while a minority (5%) exhibited delayed developmental milestones. The findings of our study indicate that epilepsy is the predominant etiological factor underlying seizures in children, with febrile seizures and CNS infections following closely behind. In contrast, Ramesh, Madhan Kumar, and Sundari demonstrated that febrile seizures are the predominant etiology of seizures in children, with



epilepsy following closely behind. In contrast, the research conducted by Chaudhary et al. in Nepal revealed a significant incidence of meningoencephalitis (15.5%) among the pediatric population. In our study, seizures were found to have metabolic etiologies in 8% of cases. These cases included two instances of organic acidemia, one case of pyridoxine deficiency, two cases of hyponatremia resulting from renal failure and gastroenteritis with hyponatremic dehydration, and several cases of hypocalcemia.

Another study has indicated that the most frequent etiology of acute symptomatic seizures is central nervous system infections, including viral encephalitis, pyogenic meningitis, tuberculous meningitis, and neurocysticercosis, as well as various metabolic causes such as inborn errors of metabolism, hypocalcemia, and hypoglycemia. The predominant therapeutic strategy employed in our investigation was Monotherapy, with polytherapy being utilized to a lesser extent. According to the research conducted by Kousalya K et al. (12), Monotherapy was the predominant therapeutic approach, followed by dual, triple, and four-drug regimens, in descending order of frequency. In the present investigation, Valproic acid was found to be the most frequently employed antiepileptic drug, followed by Levetiracetam. This finding contrasts the results of prior research conducted by Nandhakumar et al. (13), which indicated that phenytoin was the most commonly used drug, followed by sodium valproate. Similarly, Kousalya K et al. (12) reported that sodium valproate was the most commonly used drug for seizure, followed by phenytoin.

#### **Conclusion:**

In light of this study, it can be concluded that seizures are a significant factor contributing to hospital admissions among children, especially those under the age of five, at the pediatric department of Al-Arish Central Hospital in North Sinai.

Generalized tonic-clonic seizures were found to be the most prevalent type of seizure, with various underlying causes. Epilepsy was identified as the leading cause of seizures, followed by febrile seizures. Viral encephalitis is the predominant cause of symptomatic seizures with an infective origin in the central nervous system. A comprehensive medical history, meticulous physical assessment, and pertinent diagnostic tests are valuable in determining the etiology of seizures and facilitating appropriate therapeutic interventions.

#### **Recommendations:**

- Based on the findings of this study, it is recommended that a comprehensive medical history be obtained from caregivers in all instances of seizures. This is necessary to determine the seizures' underlying cause accurately and anticipate potential serious complications.
- Febrile convulsions that exhibit a high likelihood of recurrence or epileptic tendencies require specialized counseling from primary healthcare physicians and pediatric neurologists for parents.
- It is recommended that patients be promptly referred to specialized centers and consultants in pediatric neurology.
- Effective antenatal and perinatal care is crucial in preventing perinatal hypoxia, intracranial hemorrhage, and cerebral palsy.
- Effective neonatal care is essential for the timely identification and treatment of birth-related hypoxia, intracranial hemorrhage, and central nervous system infections.
- Prompt diagnosis and effective treatment of convulsions through appropriate selection of antiepileptic medications are crucial in preventing the onset of status epilepticus.

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