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Original Research Article

Comprehensive management of seizures in children at a tertiary care hospital: etiology, quality of life and treatment strategies

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ABSTRACT

Background: ILAE (International league against epilepsy 2014), defines epilepsy as at least two unprovoked seizures occurring more than 24 hours apart. It is most common neurological disorder in children about 4-5% of them experience at least one seizure in first 16 years of life. Since studies on children with antiepileptic drugs are relatively lower than in adults, the study focuses on prospective observation of etiology, quality of life and therapeutic management of seizure to improve patient care and ensure rational drug therapy through monitoring.
Methods: The data was collected from 171 parents or representatives of children who were diagnosed of seizure or epilepsy in a period of 6 months (November 2024 to April 2025). The therapeutic monitoring was performed through medical records and questionnaire that assess type of seizure, maternal factors and neonatal history of children, etiology, quality of life, and drug utilization during emergency, admission and discharge to improve patient care.
Results: Monotherapy has been highly preferred on 77% of children and the most common drug used was Clobazam of 45%, phenytoin of 12.8% and SVP of 8.48% were found in prescription pattern analysis. The most common type of seizure was generalized of 44.4%. Higher severity higher impact on quality of life of children.
Conclusions: The study suggest the importance to not only abort seizure episodes but also improvise possible post seizure complications by routine monitoring and optimized drug therapy.

Keywords: Paediatric seizures, Risk factors, Quality of life, Antiepileptic drugs, Rational drug therapy

INTRODUCTION

Epilepsy is defined as a disorder characterized by enduring predisposition to generate seizures and by the neurobiological, cognitive, psychological and social consequences.[1,2] The ILAE classifies seizure as focal, generalized, unknown whether focal or generalized and unclassified.[3] In 2014, prevalence of seizure in India was stated as 4 to 10% and Incidence of 5-10% with 25% recurrence while in an 2016 study the incidence rate was 3 per 100,000 population with highest below 3 years of age and in 2023 paper states prevalence of 0.5% to 0.1% (2,4,5,6). When seizure in children it is significant to consider on the maternal medical conditions like maternal hypertension , gestational hypertension, seizure, type1 and type-2 diabetes and neonatal history of children having low birth weight, hypoxia, or ischemia , sepsis.[7] However the studies shows heterogeneity of seizure affecting cognition , behaviour, sleep moderations and quality of life assessing the morbidity in children with epilepsy using various scales like CSHQ (Child sleep habit questionnaire),CBCL (Child behaviour checklist), Ped's QL and certain pedometers with ability to monitor sleep.[7-9] Though the relationship between sleep and epilepsy is vice versa could not be stated evidently as one causes out other.[9] Similarly children with multiple comorbidity limits the evidence of seizure disposed effect on quality of life of children.[8] Most common etiologies of

epilepsy are structural, genetic, Infectious and metabolic causes while secondarily due to certain drugs and diseases.[3] The necessity of drug utilization studies was well proved during 1960's thalidomide strategy.[5] Drug utilization review (DUR) was vocalized synonymous to Drug utilization evaluation (DUE).[5] World health organization defines DUE as "the marketing, distribution, prescription and use of drug in the society with special importance on the medical, social, and economic consequences".[4]

Drug utilization studies paves way for betterment of patient care through rational assessment of therapeutic plan along with safety profile ensuring the safety and efficacy of a drug and drug therapy in larger population and vulnerable subjects.[10] In developing country like India, DUE studies benefits children who are generally termed as " therapeutic orphans" due to lack of clinical studies and since clinical pharmacy is still a developing profession it raises therapeutic concerns.[4] The success of management of epilepsy depends on the type of seizure, the underlying cause , selection of appropriate antiepileptic drugs and the pharmacokinetic profiling.[2] Anti-epileptic drugs are classified as conventional (phenobarbital, primidone, diazepam, phenytoin, fosphenytoin, valproic acid and carbamazepine and newer AED's (gabapentin, lamotrigine, levetiracetam, topiramate, oxcarbazepine and vigabatrin.[11] Newer drugs adjuvant to conventional drug therapy extends the therapeutic success.[12]

Antiepileptic drugs are classified based on mechanism of action as sodium -channel blocker, Calcium channel blocker, Gama amino butyric acid (GABA) enhancers, glutamate blockers, carbonic anhydrase inhibitors.[5] Generalized seizure was found most prevalent seizure which contradicts from western countries where focal seizures was prevalent and phenytoin, valproate was mostly chosen in INDIA.[5-13] WHO ninth list for children (2023) provides optimal drug and drug dosage.[14] The study on basis of above literature search aims to evaluate severity of seizure and therapeutic management of seizure.

METHODS

Study design and setting

The study was conducted in department of Paediatrics at Government Medical College and Hospital (RMMCH), Cuddalore district, Annamalai University, Annamalai Nagar, Tamil Nadu which is 1200 bedded multi - speciality rural tertiary care teaching hospital.

Study duration

The study was conducted over a period of six months from November 2024 to April 2025.

Study population

A total of 171 Children clinically diagnosed as seizure or epilepsy on the paediatrics (only Inpatient) population are included on the study based on inclusion and exclusion criteria. Children between 1.5 and 16 years were included in the study.

Sample size

Z = 95%

P= Population proportion=0.5

d=0.33

$N = (Z^2 \times p\,(1 - p))/ (d^2)$

$N = ((1.96)^2 \times 0.5\,(1 + 0.5))/(0.333)^2$

$N= 3.8416 \times 0.05 \times 0.95/0.033$

N = 0.182472/0.00109

N = 171

Inclusion criteria

Children between 1.5 Year and 16 years of age, children diagnosed as seizure, children attenders are generally expected to respond to questionnaires, only casualty and admission cases are involved in the study.

Exclusion criteria

Neonatal seizure cases are not involved in the study, follow-up OP cases are not involved in study.

Study materials

A data collection form was used to record patient details including demographic information (age, gender, height, weight, patient identification number), seizure type, Health records of children, complaints of seizure and medical records of anti-epileptic drugs given.

Data collection and study procedure

The proforma collects the data required from various sources like health records, direct interactions with parents to monitor the behavioural and sleep patterns questionnaire based on the items of CSHQ /CBCL scale and further compliance with medications of children. Rationality of drug therapy was evaluated using ILAE recommendations and WHO model list of essential medicines.[14] The study also monitors the severity based on Chalfont seizure severity scale items and drug utilization pattern.[15-21] The data piled were grouped into excel and analysed using statistical tools to produce results.

Statistical analysis

The data gathered will be recorded using Microsoft excel and analysed using relevant statistical tool (JSAP version 0.19.3) to provide significant results.

RESULTS

Socio demographic details

Among 171 subjects of age group 1 year to 16 years diagnosed as seizure or epilepsy, major age group were around 1 to 5 years (65%), with the predominance of female population (59%) and male population (42%). Generalized tonic-clonic seizure (42.27%) were most common than the focal and other types of seizures or epilepsy. The frequency distribution of age, type of seizure are given below in Table 1.

Etiology and risk factors

In the study binomial tests was performed to determine risk factors that commonly co-occur with seizure in which children data showed acute metabolic disorders (4), genetic conditions (8), History of seizure in family (39), Infections (23), medical conditions (3), trauma and vascular diseases (2). Though the underlying cause was not stated in more cases. The study also thrives to identify the genetic possibilities of seizure through monitoring maternal and neonatal medical conditions.

Among 171 children diagnosed with seizure, 37.9% of them had a history of seizure disorder.

Table 1: Age wise occurrence of seizure -contingency table.

Seizure	Age (years)				
Diagnosis	**1 to 5**	**5 to10**	**10 to 15**	**16**	**Total**
Simple febrile seizure	52	15	5	0	72
Complex febrile seizure	5	1	0	0	6
Febrile status epilepticus	10	4	1	0	15
Focal seizure	1	1	0	0	2
Absence seizure	0	1	0	0	1
Status epilepticus	3	2	1	1	7
Seizure disorder	5	3	3	0	11
Breakthrough seizure	12	5	1	0	18
Withdrawal seizure	3	0	2	0	5
Refractory seizure	1	0	0	0	1
Recurrent seizure	1	0	0	0	1
Unprovoked seizure	11	9	3	0	23
Structural epilepsy	1	0	0	0	1
Hypoxia seizure	4	1	0	0	5
Hypoglycemic seizure	1	0	0	0	1
Seizure with altered sensorium	1	0	0	0	1
Total	111	42	17	1	171

Table 2: Risk factors with clinical significance.

Risk factors	Percentage
H/O seizure in family	18.7
Infections	12.9
Genetic conditions	4.675
Acute metabolic disorder	2.34
Others	≤1.7
Genetic factors – maternal	
Hypothyroid	9.942
Seizure	4.678
Hypertension	9.942
Eclampsia	80.117
Diabetes	1.170
Neonatal factors	
Low birthweight	6.433

Continued.

Risk factors	Percentage
Birth asphyxia	1.170
Preterm birth	2.924
Hypoglycemia	2.924
Seizure	4.094
Sepsis	1.170
Multifactorial	9.942

Table 3: Observed comorbidities with clinical significance.

Comorbidities	Percentage	P value
Seizure	37.9%	<0.001
Respiratory infection	11.1%	<0.001
Metabolic disorders	2.9%	<0.001
Other	<or=1.2%	<0.001
Nil	35.7%	<0.001

Interpretation

The binomial test compares whether the observed proportion of each risk factor differs significantly from a hypothesized. Risk factors occur 50% less frequently identified and the difference is statistically significant. Recurrence of seizure in children with H/O seizure in the family and infections (Table 2).

Interpretation

The test reveals that comorbidities History of seizure (37.9%) and respiratory infections (11.1%), are statistically significant in the population. This analysis helps in understanding which conditions frequently co-occur and may require more focused medical attention (Table 3).

Assessment of severity of seizure on children

The study observes the items of Chalfont seizure severity scale to study seizure severity with 7 items such as how often does seizure occur? What type of seizure did the individual experience? How long did the seizure last? Did the individual loss consciousness during seizure? How long did the postictal phase last? Did the individual experience any injuries during or after the seizure? and how did the seizure affect the individual's daily activities and interpret the severity of seizure. The severity assessment along with statistical test provides meaningful interpretations of how seizure may affect overall growth of the children. The following scoring system categories severity as mild (67%), moderate (17%) and severe (14%) which was shown below.

Table 4: Chalfont seizure severity components.

Severity component	Category	Frequency	Percentage (%)
Seizure frequency	1- 2 seizures per week	12	7.018
	1-3 seizures per month	29	16.959
	Daily seizures	2	1.170
	Less than 1 seizure per month	124	72.515
	More than 2 seizures per week	4	2.339
Duration of seizure	Less than 1 min	11	6.43
	1 min to 2 min	14	7.60
	2 min to 5 min	71	41.52
	5 min to 10 min	41	23.91
	More than 10 min	35	20.46
Loss of consciousness	Present	69	40.3
	Absent	102	59
Injuries prior or after seizure	Mild	24	14.03
	Moderate	25	14.62
	Severe	1	17.7
Type of seizure	Generalized tonic-clonic	66	44.4
	Absence seizure	5	4.70
	Simple partial	4	2.33
	Myoclonic	3	1.75

Continued.

Severity component	Category	Frequency	Percentage (%)
	Others	82	47.95
Post-ictal phase	Less than 10 min	46	26.9
	10 to 30 min	5	2.92
	30 to 60 min	1	0.58
Daily activities	Mild	101	59.064
	Moderate	36	21.053
	Severe	7	15.789

Table 5: Chi-square test.

Chi-square test (χ^2)	Degree of freedom (DF)	Sample size (N)	P value
56.391	8	171	<0.001

Comparison of different type of seizure and seizure severity

Interpretation

The chi-square test was performed to determine the severity of seizure and its variance with seizure severity, it was found that P-Value <0.001 indicates a high association between seizure type and severity. In other words, certain type of seizure more likely to be severe or mild.

Quality of life and behavioral pattern

Seizure being a neurological disorder there are possibilities of it affecting the sleep, behavior and growth pattern of children, though stronger evidences are needed for such statement. Hence the study observes the sleep pattern, growth and development in children. Based on the medical records majority of the children representatives complained of drowsiness (48%), Quality of life based on daily activities like listening, schooling, attention was noted among which 55% of them answered positive.

Though the psychological behavior like aggressiveness, hyperactivity is seen in fewer children, there is often more than one such behavior hence not discussed in detail.

Comparison between seizure severity score and children with GDD

A one-way ANOVA revealed a statistically significant difference in severity scale scores between children with and without GDD.F(1,169), P-value=<0.001, with an effect size of 0. 148 Children with GDD has a significantly higher mean severity score with mean of 19 compared to those children without GDD (Mean of 13.6). These findings suggest GDD may be associated with seizure severity, even though it is not directly included in the severity scoring system.

Man-Whittney test

Alternative hypothesis: Group 0<Group 1. Psychological factors such as aggressiveness, attentiveness, thoughts/social problems, dependent variable: seizure score scale. Independent variable: Psychological factor G0: not affected, G1: affected.

Interpretation

There is a statistically significant difference in seizure severity scores of children between groups with affected (18.7%) and without affected (12.2%) daily activities. Null hypothesis was rejected. Those who have higher severity score has shown psychological variabilities negatively and vice versa.

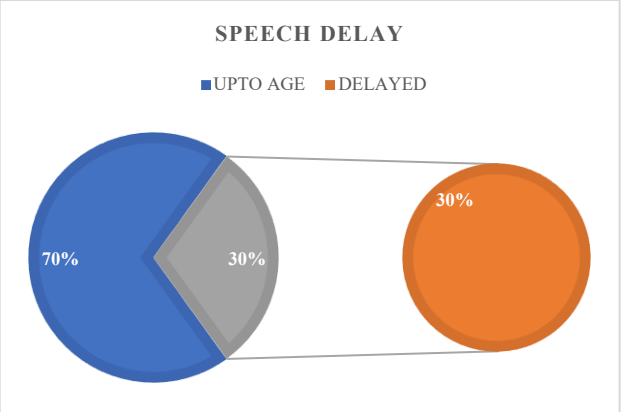

Figure 1: Vocalisation.

Clinical pharmacist -monitoring and patient care

The role of clinical pharmacist is yet flourishing in India and individualization of drug therapy is also essential especially for special group population. Routine monitoring paves way for analysis of drug therapy individually, thus providing a greater opportunity for optimal dosing and rationalization. An overall assessment also provides cost estimates. regarding cost. Aura preceding seizure are signs of seizure episodes, for that episode without limb involvement are often overlooked

due to lack of awareness and negligence from parents. The numerical below represents frequency of respective drug prescribed or a factor. On findings aura was found absent in 148 and present in 23 children. The autonomic symptoms generally presented by children are changes in heart rate, micturition, nausea or vomiting, pupillary changes, respiratory changes, sweating and or flushing. Out of which micturition on 35 and nausea symptoms on 49 were Profound. These symptomatic inputs push forward for routine monitoring. Examination of past medical history provides a clarity of multiple AED's utilized for management of seizure for children, out of which frisium (29) and sodium valproate (11). The medical compliance in children was almost positive in children (85%) and irregular in only 14%. while monotherapy remain common in 59% children, majority of children also had no follow up drug therapy. The recurrence of seizure in children revolves around questioning whether a follow up drug therapy was required and how to overcome the possibility resistance to Anti-epileptics.[6-16] On Emergency conditions, midazolam, benzodiazepine, phenobarbital, phenytoin, levetiracetam and clobazam are frequently administered to relieve seizure symptoms. While certain seizure required multidrug administration among which midazolam/phenytoin (11) was predominantly used, while others of SVP, phenytoin, levipill combinations are used. During admission, the children were profoundly given clobazam (77), while other dual therapy or monotherapy are less so prescribed like levipill/phenytoin, frisium /phenytoin. Sodium valproate (11), levipill (9), CMZ (1), phenytoin (3), midazolam (4) are frequently prescribed mono drug therapies. Another category of drugs like antidepressants (benzodiazepine) and topiramate are rarely found to be suggested.

Prescription pattern analysis

Among 171 records, only 125 prescriptions were obtained for analysis among which monotherapy, polytherapy. Dual therapy and benzodiazepine used were reported in the study (Figure 2, Figure 3). The most common monotherapy used was clobazam (45.2%) and then Phenytoin (12.86%). However, the most common type of seizure was generalized tonic-clonic. On Dual therapy, levetiracetam along with phenytoin (8) or sodium valproate (8) were predominant. Other dual combinations: Sodium valproate/phenytoin (3) and Sodium valproate/carbamazepine (1) are used less so. The prescription was classified as older drugs and newer drugs. Older drugs like phenobarbitone carbamazepine, phenytoin, sodium valproate, clobazam and benzodiazepine were 70% majority whereas newer drugs like levitiracetam and topiramate are 25% prescribed.

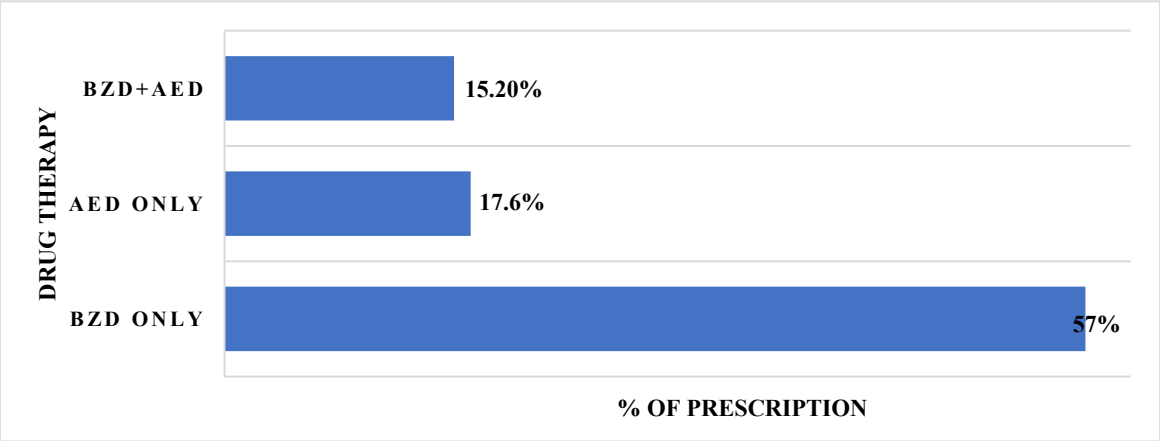

Figure 2: AED and BZD drug therapy.

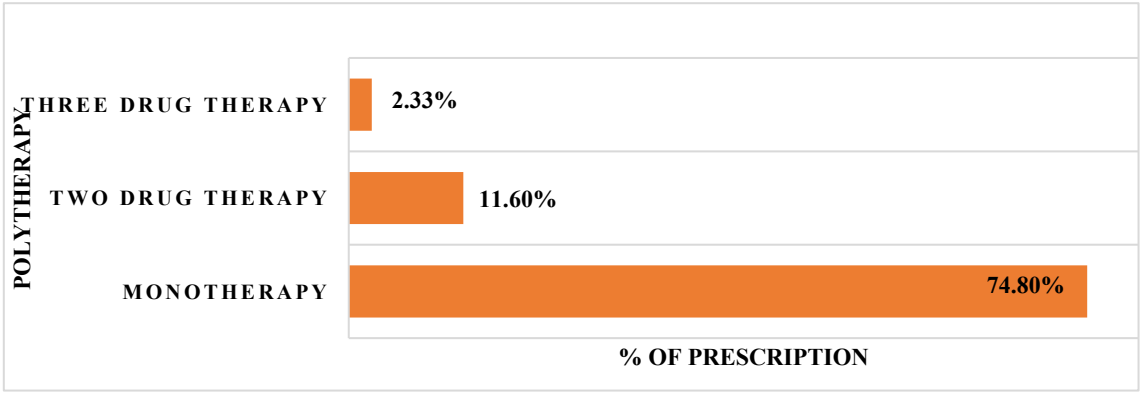

Figure 3: Polytherapy.

Rationality assessment

Rationality assessment ensures the safety and effectiveness of drug therapy. And ensures their alignment with clinical guidelines. The study checks with WHO model list of essential medicines for children 9th list and ILAE guidelines. Monotherapy was much preferred though high clobazam use raises concern but can be justified clinically. Use of appropriate AED is justified with its types like valproate, levetiracetam and carbamazepine. Short term therapy benzodiazepines are rational. Though polytherapy were similar to 30% raises concern the frequency and dosing was clinically justified.

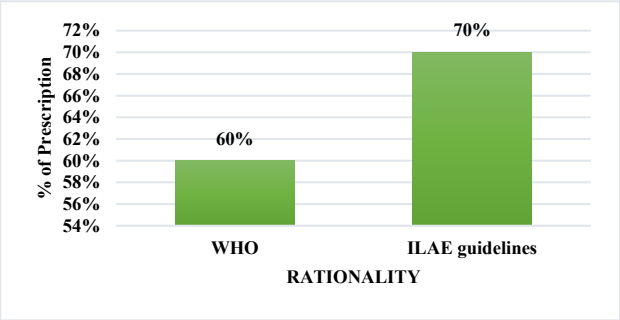

Figure 4: Rationality assessment.

DISCUSSION

This Prospective observational study evaluates the severity of seizure on children daily life and their therapeutic management. Among 171 subjects, the recorded predominant age was around 1 to 5 years old children. Females are more Affected than male. It could be said due to improvement in literacy of the society.[12] Majority of the children were affected with generalized type of seizure. The following trend is similar as in Asian countries which differs from western countries.[5-13] The maternal medical condition during pregnancy allows the possibility of the genetic association of seizure. Though only 8 of the records were found to had history of seizure. While neonatal hypoglycemia and other conditions like low birth weight, Sepsis could be another one of the reasons.[7] The risk factors find children with Respiratory infections (mostly noted where pneumonia), Metabolic disorders and past history of seizure had more recurrent seizure than the rest.

Chalfont -seizure severity scale items were used in the study, to categorize severity as mild, moderate and severe through which we can assess other factors statistically. Clinical pharmacist roles help in raising awareness through monitoring and intervention, it is essential to educate society that certain epileptic seizures do not involve limb movements.

Seizure being common in children has its effects on certain aspects like sleep, behavior and growth of the children. On analysis of sleep pattern, 45% of them had normal sleep habits, though 48% of them experienced drowsiness. The possible reason of it could probably age related or it may cause due to drug therapies. sleep and seizure are bidirectional.[9] And it could be said children who are more active physically have less such problems.[9]

An ANOVA test reveals the relationship between growth developmental delay in children and Seizure severity assessed by Chalfont seizure severity scale. The test reveals that subjects with higher severity score had growth developmental delay. Among 171 subjects, 30% of them had speech developmental delay. And this may be due to multiple factors in children where some them had other comorbidities. The non-parametric test also reveals the relationship between psychological changes in children and seizure severity. It also produces a possibility of seizure affecting the behavior of children like attentiveness, hyperactivity, aggressiveness. Since children who are affected expresses more than one such activities it was not presented in the paper. Hence the study emphasizes the need for psychiatric professional opinion there is a lack of EEG data in the study due to different date schedules, and representatives' negotiation to not visit. Here clinical pharmacist role ensures safety, efficacy and cost effectiveness of the drug therapy given. The doses are not mentioned due to wide variation in dose according to weight in each subject. The past medication history allows to determine medicinal compliance, which was 85% positive and very few % of polytherapy.

According to Prescription analysis, the most commonly used drug was clobazam and it is also a factor which reduces the rationality according the WHO 9th Essential list for children. However, three drug therapy also seems to impact rationality, the frequency and administration time differs hence providing a clinical justification. The rationality with WHO is 60% and ILAE guidelines was 70%. Certain newer drugs were used like lamotrigine and vigabatrin which are expensive compared to regular drugs, monotherapy was given in 99 prescriptions. Preference for monotherapy with AED are consistent across INDIAN studies.[10,12,15,17] Polytherapy though effective may produce side effects, they could be completely avoided.[6,18-20] The Prescription trends vary across nations while in our study the most common combination of drugs used was levetiracetam with phenytoin or with sodium valproate.[22] Lack of clinical studies on children regionally could be stated as the possibility of irrational prescriptions, since the trend of seizure and etiology of it varies from western countries.

CONCLUSION

The study highlights the multifactorial nature of seizure. The study findings shows that seizure severity will affect growth, behavior and sleep of the children. Risk factors and past medical histories like infections, family history of seizure could be said as potential triggers. Clinical monitoring and necessity of seizure developing into long

term disorder must be recognized. Prescription pattern analysis provides understanding of optimized pharmacotherapy and minimizing of therapeutic complications. Clobazam was most frequency prescribed followed by phenytoin.

Monotherapy was most commonly given has in most Asian countries. Generalized seizure was commonly identified. The study emphasizes the importance of rational therapy and a regulatory body to have a check on them, since there are a regional variance of seizure type and its severity. Regular screening of sleep cycle and pattern of growth in accordance to age is crucial for cognitive improvements in affected children. Spreading general awareness of seizure among people of its various aspects is necessary, to avoid a goal of aborting seizure only as a priority. Current clinical trends emphasize the need for individualized therapy and cautious withdrawal of AED,s in seizure-free patients.[23] Rational AED selection complies with guidelines improves pediatric seizure outcomes.[14] Though the study thrives to prove seizure as more concerning disorder, it has its own limitations as small sample size, casual response or lack of medical records of certain aspects, lacking EEG data, no exact score scales are used, only their items are used, such limitation often affect the study results and their effectiveness.

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