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Study of Etiological, Clinical And Radiological Profile Of Patients Admitted With Seizure In Pediatric Age Group

Dr Prashant Priyadarshi[1], Dr Piyush Anand[2], Dr Jyotsana Gupta[3], Dr Anshika Mishra[4]

[1] Assistant professor, Naraina Medical college and Research Centre,Kanpur
[2] Assistant professor - Rajarshi Dashrath autonomous state medical college society Ayodhya
[3] Professor, Naraina Medical college and Research Centre,Kanpur
[4] Assistant professor, Naraina Medical college and Research Centre,Kanpu

Corresponding Author

Dr Prashant Priyadarshi
Assistant professor, Naraina Medical college and Research Centre,Kanpur

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Abstract

Introduction: Seizures account for about 2% of children's hospital emergency department visits. The incidence is highest in children less than 3 years of age, with a decreasing frequency in older children.

In this study, we studied the prevalence of various etiologies, the clinical spectrum of seizure and radiological profile of children admitted in UP UMS Saifai Etawah.

Aims & Objectives:

1. **To study etiology of seizure in pediatric age group**
2. **To evaluate clinical spectrum of seizure.**
3. **Evaluation of radiological findings in seizure patients.**
4. **Evaluation of electroencephalographic finding of seizure patients.**

Materials & Methods: It was a Prospective Cross sectional study carried out in the departments of pediatrics, neurology and radio diagnosis of U.P. UMS Saifai Etawah on 256 Children aged between 3 months to 14 years with complaint of seizure between January 2015- July 2016.

Detailed history with complete neurological and other systemic examination was done to determine associated neuroimpairments

Statistical analysis was done using Chi Square test.

Observations: Most common clinical feature was Fever (79.29%), followed by Vomiting (45.70%) and Headache (37.57%) while least common clinical feature was fever with rashes (0.78%).

Most common etiology in study population was TBM (n=46; 17.97%) followed by viral meningoencephalitis (n=31; 12.1%) while least common etiology in study population was CVA (n=2; 0.78).

Conclusion: It can be summarized from our study that most of acute symptomatic seizures are caused by CNS infections like meningitis and encephalitis, febrile seizures neurocysticercosis, which can be prevented with improvement in health care facilities.

Keywords: Seizures, Epilepsy, Fever, Neuroinfections.

Introduction: Seizure is an impermanent occurrence of signs or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. When the above is associated with motor component then they are known as convulsions. Epilepsy is a condition characterized by recurrent (two or more) unprovoked seizures occurring 24 hours apart.

Seizures are the most common manifestation of pediatric neurological disorder. 4-10 % children have seizure during first 16 years of life. [1] Seizures account for about 1% of all emergency department visits, and about 2% of children's hospital

emergency department visits. [2] The incidence is highest in children less than 3 years of age, with a decreasing frequency in older children. [1]

In our prospective cross sectional study, we studied the prevalence of various etiologies, the clinical spectrum of seizure and radiological profile of children admitted in UP UMS Saifai Etawah with seizure that will be a contribution in not only help to identify seizure but also to manage case.

Aims & Objectives:

1. To study etiology of seizure in pediatric age group
2. To evaluate clinical spectrum of seizure.
3. Evaluation of radiological findings in seizure patients.
4. Evaluation of electroencephalographic finding of seizure patients.

Materials & Methods:

Study Design:-

The present study was a Prospective Cross sectional study carried out in the departments of pediatrics, neurology and radio diagnosis of U.P. UMS Saifai Etawah, a tertiary care referral center in central U.P between January 2015- July 2016.

Study Population:-

256 Children aged between 3 month to 14 year presented with complaint of seizure (with or without fever) in department of pediatrics, U.P. UMS Saifai, Etawah, were included in the study.

Inclusion Criteria:-

Children aged group after 3 month to 14 years who presented with seizure, in pediatric emergency department.

Exclusion Criteria:-

1. Neonatal seizures.
2. Conversion and psychiatric disorders.
3. Children with hepatic and uremic encephalopathy.
4. Seizure associated with acute trauma.
5. Patient attendant refuse to give consent.
6. Seizure associated with poisoning.

Study Tools: -

- Prestructured proforma for data collection to evaluate clinical profile.
- Lab. Investigations-CBC, Serum electrolyte, RFT/LFT, RBS.
- CT-SCAN: Siemens Somatom 64 Slice CT-Scan.
- MRI- Company Philips Achiva. (1.5tesla) 2008.
- EEG-Model: Ceegraph Netlink 40 Channel.

The cases were classified into three age groups: 3months -5 years, 6-10 years and 11-14 years Detailed history taking including age of onset, developmental history, presence of prenatal, perinatal and postnatal insults. History of fever before the attacks or other situation related to epilepsies, History of acute CNS insults before the onset of the seizures as severe head trauma, meningoencephalities among others, progressive brain disease, or other chronic medical illnesses.

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Family history included, consanguineous marriage, history of epilepsy in the family, as well as other related conditions as febrile convulsions.

Complete neurological and other systemic examination was done to determine associated neuroimpairments

Statistical analysis was done using Chi Square test.

Observations:

Age wise distribution of study population

Majority of patients were aged 3m-5 years (50.78%), followed by 6-10 years (36.33%) and least common age group was 11-14years (12.89%).

Comparison between Type of seizure and patients with fever and without fever

Proportion of febrile patients was found to be higher as compared to afebrile for GTCS type of seizure (66.00% vs. 32.14%) only, for rest of the types of seizure proportion of afebrile patients was higher as compared to febrile – Simple (25.0% vs. 15.50%), Complex (12.50% vs. 8.0%), Secondary generalized (21.43% vs. 5.00%), Atonic seizure (1.79% vs. 0.00%) and Status epilepticus (7.14% vs. 5.50%). Association of type of seizure in febrile and afebrile patients was found to be statistically significant.

Type of seizure	**Febrile (n=200)**		**Afebrile (n=56)**		**Total (N=256)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
GTCS	132	66.00	18	32.14	150	58.59
Simple	31	15.50	14	25.00	45	17.58
Complex	16	8.00	7	12.50	23	8.98
Secondary Generalization	10	5.00	12	21.43	22	8.59
Atonic Seizure	0	0.00	1	1.79	1	0.39
Status Epilepticus	11	5.50	4	7.14	15	5.86
Absence seizers	0	0	0	0	0	0
Total	200	100	56	100	256	100
	χ^2=29.305 (df=5); p<0.001					

Clinical feature of seizure patients or study population Table shows clinical features of study population. Most common clinical feature was Fever (79.29%), followed by Vomiting (45.70%), Headache (37.57%) while least common clinical feature was fever with rashes (0.78%) followed by loose stool (3.12%).

S.N	**Clinical features**	**No.**	**%**
1	Altered Sensorium	44	17.18
2	Fever	203	79.29
3	Headache	96	37.5
4	Vomiting	117	45.70
5	Hemiparesis	10	3.9
6	Fever with Rash	2	0.78
7	Sign of raised ICT	73	28.51

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8	Sign of meningitis	81	31.64
9	Hepatosplenomegaly	12	4.68
10	Refusal to feed	10	3.9
11	Loose stool	8	3.12

Distribution of patients according to aetiology

Most common etiology in study population was TBM (n=46; 17.97%) followed by viral meningoencephalitis (n=31; 12.1%) followed by Birth asphyxia sequel +CP+SD (n=29; 11.32%) and Febrile seizure, NCC (n=27 each; 10.55%), Seizer disorder (n=24; 9.38%), Cerebral malaria (n=22; 8.59%) and Pyogenic meningitis and tuberculoma (n=21 each; 8.20%) while least common etiology in study population was CVA (n=2; 0.78) followed by metabolic(n=6;2.34%).

	Etiology	**No. of patients**	**Percentage**
1	NCC	27	10.55
2	TBM	46	17.97
3	Tuberculoma	21	8.20
4	Cerebral malaria	22	8.59
5	Febrile seizure	27	10.55
6	Pyogenic meningitis	21	8.20
7	Viral meningoencephalitis	31	12.1
8	Birth asphyxia sequel +CP+SD	29	11.32
9	Metabolic	6	2.34
10	Seizers disorder	24	9.38
11	CVA	2	0.78
	Total	256	100.00

Association of Neuro-Imaging (CT/MRI) findings with etiology

Proportion of patients with normal CT findings was higher as compared to those with abnormal CT findings presenting with etiologies Cerebral malaria (2.75% vs. 0.0%), Febrile seizure (8.25% vs. 0.00%), Pyogenic meningitis (15.59% vs. 1.08%), viral meningoencephalitis (15.6% vs. 1.08%), Seizure disorder (22.01% . vs. 2.17%), Birth asphyxia sequelae Cerebral palsy with seizure disorder (17.43% vs. 13.04%), while proportion of patients with abnormal CT findings was higher as compared to normal CT findings with etiologies NCC (29.34% vs. 0.0%), TBM (28.26% vs. 18.34%), tuberculoma (22.82% vs. 0.0%), and CVA (2.17% vs. 0.0%). A statistically significant association between CT findings and etiology was found ($p<0.001$).

Etiology	**Normal CT/MRI findings (n=109)**		**Abnormal CT/MRI findings (n=92)**		**Total**
	No.	**%**	**No.**	**%**	**No.**
NCC	0	0.00	27	29.34	27

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TBM	20	18.34	26	28.26	45
Tuberculoma	0	0.00	21	22.82	21
Cerebral malaria	3	2.75	0	0.00	3
Febrile seizure	9	8.25	0	0.00	9
Pyogenic meningitis	17	15.59	1	1.08	18
Viral meningoencephalitis	17	15.6	1	1.08	18
Birth asphyxia sequale Cerebral palsy+ SD	19	17.43	12	13.04	23
Seizer disorder	24	22.01	2	2.17	21
CVA	0	0.00	2	2.17	2
Total	109	100	92	100	201
	χ^2=109.509 (df=10); p<0.001				

Association of EEG findings with etiology

Proportion of patients with normal EEG was higher as compared to abnormal EEG in patients with etiologies – NCC (18.55% vs. 10.00%), TBM (4.84% vs. 0.00%), tuberculoma (15.32% vs. 10.00%), Cerebral malaria (0.81% vs. 0.00%), febrile seizure (21.77% vs. 0.00%), Pyogenic meningitis (2.42% vs. 0.00%), Aseptic meningitis (10.48% vs. 0.00%), CVA (0.81% vs. 0.00%) and Cerebral palsy with seizure disorder (0.81% vs. 0.00%) while proportion of patients with abnormal EEG was higher with etiologies. Birth asphyxia sequelae with cerebral palsy with seizure disorder (35.00% vs.12.90%), Seizuer disorder (45.00% vs. 12.10%). A statistically significant association between etiology and EEG findings was found (p=0.002).

Etiology	**Normal EEG (n=124)**		**Abnormal EEG (n=20)**	
	No.	**%**	**No.**	**%**
NCC	23	18.55	2	10.00
TBM	6	4.84	0	0.00
Tuberculoma	19	15.32	2	10.00
Cerebral malaria	1	0.81	0	0.00
Febrile seizure	27	21.77	0	0.00
Pyomeningitis	3	2.42	0	0.00
Aseptic meningitis	13	10.48	0	0.00
Birth asphyxia sequelae CP+SD	16	12.90	7	35.00
Seizer disorder	15	12.10	9	45.00
CVA	1	0.81	0	0.00
Total	124	100	20	100
	χ^2=25.737 (df=9); p=0.002			

Relation between etiology and seizure type

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Neuroinfections are most common cause for both generalized and focal seizure. Among neuroinfection proportion of patient with GTCS 25.33% was higher in tubercular meningitis, and proportion of patients with partial seizure with secondary generalization was higher in neurocysticercosis 50% and tuberculoma 40.9%. A statistically significant association between etiology and seizure type was found (p=0.001).

AETIOLOGY	**GTCS (n=150)**		**SPS (n=45)**		**CPS (n=23)**		**SEC-GEN (n=22)**		**ATONIC SEIZURE (n=1)**		**STATUS EPILEPTICUS. (n=15)**	
	No	%	No	%	No	%	No	%	No	%	No	%
NCC	4	2.66	10	22.2	2	8.7	11	50	0	0	0	0
TBM	38	25.3	1	2.2	1	4.34	1	4.54	0	0	5	33.3
Tuberculoma	7	4.66	1	2.2	4	17.4	9	40.9	0	0	0	0
Cerebral malaria	19	12.6	0	0	1	4.34	0	0	0	0	2	13.3
Febrile seizure	9	6	13	28.8	5	21.7	0	0	0	0	0	0
Pyogenic meningitis	15	10	4	8.88	1	4.34	1	4.54	0	0	0	0
Viral meningoencephalitis	24	16	3	6.66	2	8.7	0	0	0	0	2	13.3
Birth asphyxia sequeale CP+SD	18	12	5	11.1	4	17.4	0	0	0	0	2	13.3
Metabolic	5	3.33	1	2.2	0	0	0	0	0	0	0	0
Seizer disorder	11	7.33	6	13.3	2	8.7	0	0	1	100	4	26.6
CVA	0	0	1	2.2	1	4.34	0	0	0	0	0	0
TOTAL	150	100	45	100	23	100	22	100	1	100	15	100
χ^2=178.221 (df=50); p<0.001												

Discussion: Seizures coexisted with fever in 78.12% of cases in the present study, and the almost similar finding were noted 69.2% by **Arpita Gogoi et al**., [3] 68% by **Chen et al.** [4] and 53.5% by **Adhikari et al**. [5] Vomiting is second most common symptom associated with seizures in our study seen in 45.7% while 45.8%in study done by **Dr Bhupesh Jain et al.** [6] Headache was third common symptom in 37.5% of patients while headache was the most consistent symptom seen in 72% in study of **G Sendil** [121] and in 16% of patient in the study of **Bhupesh Jain et al.** [6] in our study altered sensorium seen in 17.2% of patients, while altered sensorium is the most common symptom 100 % in study done by **Bhupesh Jain et al**. [6] 31.64% patients having sign of meningitis in our study. Sign of raised ICT, hepatospleenomegaly and Hemiparesis were seen in 28.51%, 4.7% 3.9% in our study.

Etiological analysis revealed out of 256 children CNS infections to be commonest cause (46.8%) of seizure in pediatric age group, followed by space occupying lesion (18.75), birth asphyxia sequeale with cerebral palsy with seizure disorder (11.32) febrile Seizures (10.5%), Seizer disorder (9.38%), and metabolic causes. Similar findings were found in the study of **Singh et al**[7]. Where central nervous system infection was common etiology followed by space occupying lesions, epilepsy, febrile seizure and metabolic causes**.** And contrary to our findings were noted by **Chen et al.** [17] where febrile

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seizures were commonest cause followed by epilepsy and CNS infections. Similar finding were noted in study of **Singh et al**. **too.**[7] Only 2.34% patients were found to have a metabolic cause for seizure. Such a low incidence may be due to exclusion of less than 3 month old children from our study who contributes maximally to metabolic causes of seizures. The study of **Huang et al** [8] reported 11% cases with metabolic etiology for seizures but their study population was comprised children up to only 3yrs of age. **Chen et al** [4] reported only 3 out 319 as metabolic etiology for seizures

Worldwide literature reveals that abnormal neuroimaging seems to be more associated with focal seizures than generalized seizures.[9] We performed neuroimaging in as many cases as possible (216/256). We also observed the same. . We would like to remark that 9% of febrile seizure patients who underwent neuroimaging as a part of workup had normal CT findings in all. Thus we suggest that neuroimaging is a definite first line investigation in patients with focal seizures and that in other patients it could be considered after detailed physical and neurological examination. By this we can avoid unnecessary radiation to the children. In fact **Chen et al** [4] reported normal CT findings in all patients with complex febrile seizures. Some study reported abnormal EEG only in 22% of patients which could be due to very high proportion of febrile seizure patients in their study. Our study has lower number 20 (13.8%) of abnormal EEG which is contrary to other studies. This could be due to resource limitation like ours where bed side EEG is not available and most patients get an EEG done during inter-ictal periods.

Whether routine neuroimaging should be done in all children admitted with acute episode of seizure is debated.[4,10] In this study abnormal neuroimaging was present in 92 (45.77%) and abnormal CT was found more in older afebrile children in the 6-14 years age group, mostly due to neurocysticercosis.

Febrile seizures have been reported to be one of the most common causes of seizure attack in children. [4, 11] We found that febrile seizures (16.15%) were the second most common etiology of seizure after tubercular meningitis in children less than 5 years of age, and this was reported as 53% by **Adhikari et al.** [5] Overall, tubercular meningitis was the commonest etiology in our study in children aged 3month to 10 years (18.83%) followed by febrile seizure (12.1%). But in the study of **singh et al.** [7] CNS (viral) infection most common etiology (48%) and in other studies the commonest etiology was febrile seizures (62%) in the study by **Chen et al**. [4] while it was 71% as found by **Landfish et al**. [12]

Conclusion: It can be summarized from our study that most of acute symptomatic seizures are caused by CNS infections like meningitis and encephalitis, febrile seizures neurocysticercosis, which can be prevented with improvement in health care facilities.

CNS infections, followed by intracranial space occupying lesion (NCC and tuberculoma), seizer disorder and febrile seizures were commonest etiological reasons especially in context of a developing country and regional considerations.

CSF analysis, Neuroimaging and EEG have the most important role in diagnosis of seizures however we suggest a good clinical evaluation should be ensured before advising these investigation especially CT scans where exposure of pediatric patients to radiation and its effects are still an area of study.

Those children who present with unprovoked seizures (i.e. seizure disorders as established by EEG) require long term follow up studies including serial neurophysiologic studies and neuroimaging (CT or MRI) for better understanding of the evolution of childhood seizure disorders.

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Management of seizure is always multi modal which constitutes treatment of underlying etiology, avoidance of precipitating factors, suppression of recurrent seizures by prophylactic therapy and addressing a variety of psychological and social issues.

We suggest a long term follow-up study in patients with seizures with regards to their neurobehavioral outcomes.

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