IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 01 Ver. III January. (2018), PP 38-44
www.iosrjournals.org

Clinical Study of Febrile Seizures in Children Correlating with Laboratory Criteria in Tertiary Hospital

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Abstract:
Aims and Objectives: *To study gender predilection, risk of family history of Febrile Seizures, family history of epilepsy and compare the lab parameters in children with Febrile Seizures and children with Febrile Illness.*
Methods: *A case control study done in Niloufer Hospital for a period of one year. It was composed of 120 children out of which 60 were cases with Febrile Seizures and 60 were without Febrile Seizures.*
Results: *Out of 60 cases of Febrile Seizures 76% cases were simple Febrile Seizures and 24% were complex Febrile Seizures. 23% cases had family history whereas in controls 6.6% had family history.*
Conclusion: *In this study majority of the children were below two years of age and the incidents of Febrile Seizures is higher in males which is 53.8%.There is significant difference of serum sodium levels between cases and control.*
Key Words: *Calcium, Epilepsy, Febrile Seizures, Hyponatremia, Recurrence, Sodium,*

I. INTRODUCTION

Seizure disorders are among the most frequent neurological problems that occur in childhood (1). Childhood epilepsies are a heterogeneous group of conditions that differ in their diagnostic criteria and management and have dramatically different outcomes. A seizure or convulsion is a paroxysmal, time limited change in motor activity and/or behavior that results from abnormal electrical activity in the brain. Seizures are common in pediatric age group and occur in approx 10% of children. Less than one third of seizures in children are caused by epilepsy, a condition in which seizures are triggered recurrently from within the brain. Epilepsy is considered to be present when two or more unprovoked seizures occur at an interval greater than 24 hr apart. The incidence of epilepsy is 3% more than half of the cases begin in childhood.

Febrile Seizures are the most common seizure disorder during childhood they are age dependent and are rare before 9 months and after 5 years of age. The peak onset being 14 to 18 months of age and the incidence approaches 3 to 4 of young children. They are genetically determined strong family history of febrile convulsions in siblings and parents suggest genetic predisposition. There is a lack of data regarding the incidence of febrile seizures in Indian population. They are slightly common in males. Few children will have a first episode after three years. It has been found that 21% children had a convulsion is a either before or within one hour of onset of fever, 57% between 1 to 24 hours after onset of fever and 22% had a convulsion more than 24 hours after onset of fever (3). In 1980, a consensus conference held by National Institute of Health described a Febrile Seizure as, An event infancy or childhood usually occurring between three months and five years of age associated with fever, but without evidence of intracranial infection or defined cause.

The generally accepted criteria for Febrile Seizure include:
A convulsion associated with temperature greater than 38 degree Celsius.
A child younger than five years of age.
No central nervous system infection or inflammation.
No acute systemic metabolic abnormality that may produce convulsion

II. AIMS AND OBJECTIVES

- To study the gender predilection in Febrile Seizures.
- To study the risk of the family history of Febrile Seizures, family history of epilepsy in children with Febrile Seizures.
    - To compare haemoglobin, serum sodium, calcium and glucose levels and CRP positivity to find any significant difference of the above lab parameters in children with Febrile Seizures and Febrile Illness.

III. MATERIALS AND METHODS

This study is a case control study done in department of pediatrics, Niloufer Hospital for a period of one year July, 2015 to 2016.

Sample Size:

Study population composed of 120 children out of which 60 were cases with Febrile Seizures and 60 were without Febrile Seizures.

Inclusion Criteria:

All pediatric patients were Febrile Seizures between the age group of six months to five years admitted in Niloufer Hospital will be taken as cases. Febrile Seizures being defined as seizure occurring in the absence of CNS infection or any other defined cause of seizures.

* Those with Febrile Illness will be taken as control.

Exclusion Criteria:

- Children with CNS infection.
- Any other defined cause of seizures.
- Children with developmental delay.
- Child on iron therapy.
- Systemic metabolic abnormalities which produce seizures.
- Neurological disorders.
- Neurodegenerative disorders.

Methods and Investigations:

A detailed history, general examination and systemic examination was carried on and followed by laboratory investigations for the children admitted with seizures between six months to five years and control group is selected from age and sex matched children admitted with Febrile Illness more than 38 degrees Celsius.

Investigations:

Estimation of haemoglobin, C-reactive protein, serum sodium, serum glucose, serum calcium levels.

Statistical Analysis:

Statistical analysis was done using Windostat Version 8.6 statistical analyser. Statistical data t test applied. T value was chosen as the data was continuous and we wanted to find out significant differences between the two groups.

III. Results

Total numbers of children recruited in the study were 120 out of which 60 were cases and 60 were controls.

Table 1: Frequency Distribution based on Age and Gender.

Character	Number	Age in M ± SD	Male Number	Male %	Female Number	Female %
Case	60	24.51 ± 16.09	35	58.3%	25	41.66%
Control	60	24.83 ± 15.14	39	65%	21	35%

Age of Presentation:

- The mean age of cases at presentation was 24.51 +/- 16.09 months and the mean age of controls was 24.83 +/- 15.14 months.
- The maximum numbers of children presented were below two years of age.
- The numbers of males were slightly higher in controls than in the case group.

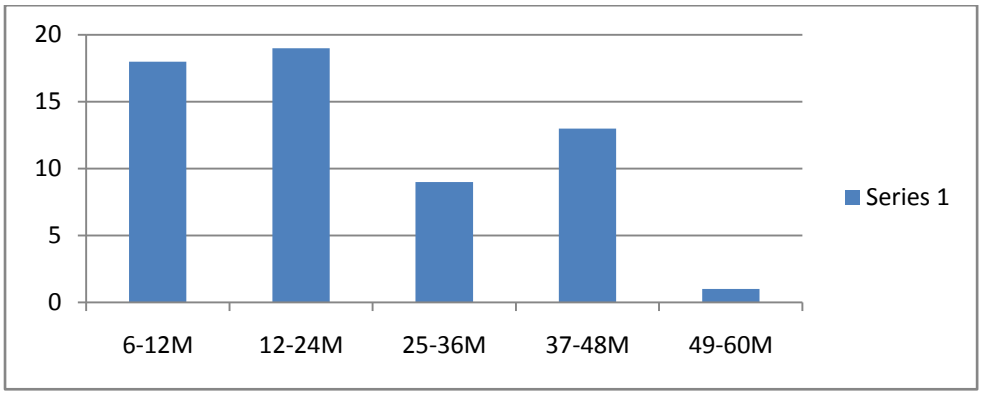

Fig 1: Age Distribution among the Cases in Month

Associated Complaints:

Out of 60 cases of children presenting with Febrile Seizures 38% had respiratory tract infections as the cause of fever.

Male to Female Ratio:

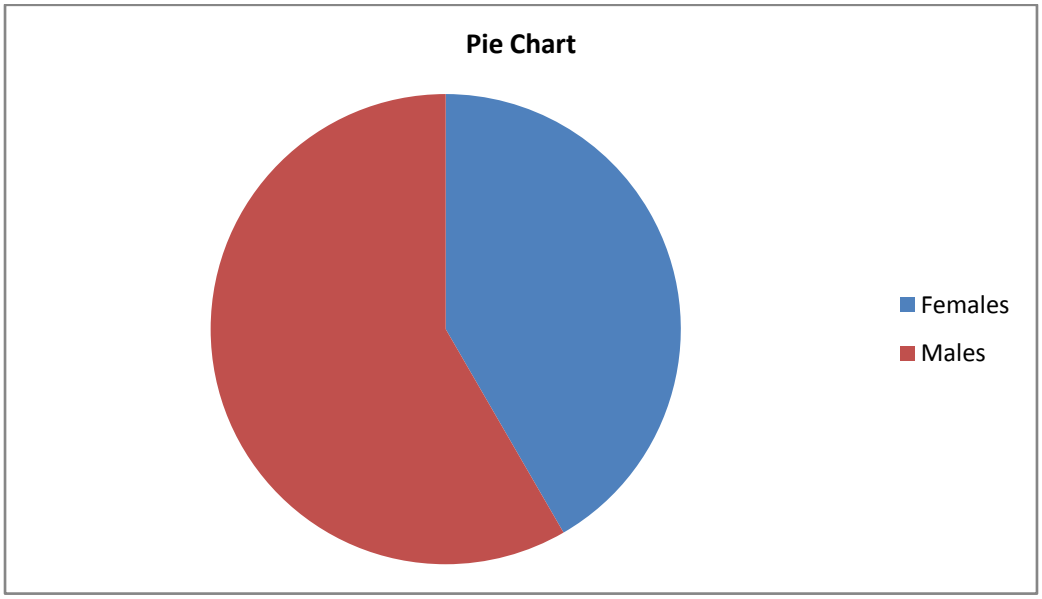

Fig 2: Ratio of males to females represented in Pie Chart.

- Out of sixty cases taken 58.30% were males and 41.60% were females.

Type of Febrile Seizures:

- Out of sixty cases of Febrile Seizures 46 (76%) cases were simple Febrile Seizures 14 (24%) were complex Febrile Seizures
- Out of sixty cases 14 (23%) cases had family history of Febrile Seizures where as in controls there are 4 (6.6%) had family history of Febrile Seizures.
- Family history of Febrile Seizures was higher in case group (18%) than in control group (13%) which suggests a role genetic predisposition in the etiology of Febrile Seizures.
- There is a family history of seizure disorder in 13% children of case group and in 8% children of control group.

Comparison of Temperature and Haemoglobin in Case and Control Group:

Table 2: Application of t test for case and control group temperature in F

	Case	Control	Pooled	SED	CD95%	P Value
						0.7861
N	60	60	120			
Mean	101.13	101.20	101.16	0.239	0.4374	
SD	1.393	1.219	0.239			
Standard Error	0.1799	0.1574				
T Test	0.2719					

The mean temperature of case group is 101.13 SD ± 1.39 F where as mean temperature group 101.2 SD ± 1.21F. The results are not significant.

Table 3: application of t test per case and control group haemoglobin gm%

	Case	Control	Pooled	SED	CD95%	P Value
						0.0042
N	60	60	120			
Mean	10.871	11.698	11.285	0.283	0.561	
SD	1.577	1.530	0.283			
Standard Error	0.203	0.197				
T Test	2.913					

- The mean haemoglobin for case group is 10.87 SD ± 1.577gm% and the mean haemoglobin for control group is 11.69 SD ± 1.533gm%.
- t value for haemoglobin is 2.913 and is statistically significant (p=0.0042). The haemoglobin levels were significantly lower in case group compared to control group.
- Out of sixty cases 25 (41.6%) children had haemoglobin less than 11 gm% whereas 12(20%) children in controls had haemoglobin less than 11%.

Calcium: **Table 4: Comparison of Calcium**

	Mean	SD	P Value
Cases	10.018	0.674	0.34
Controls	10.07	0.568	

The mean serum calcium levels in case group is 10.01 and control group is 10.07 and the P value is not significant suggesting that there is no relation between Febrile Seizures and Serum Calcium

Table 5: Comparison of Serum Sodium Levels in Cases and Controls

	Case	**Control**	**Pooled**	**P Value**
				0.00125
N	60	60	120	
Mean	135.91	139.3		
SD	5.82	4.51		
Standard Error	0.756	0.587		
T Test	2.234			

The mean serum sodium level in children with Febrile Seizures is 135.91 meq/lit and the mean serum sodium levels in controls is 139.3 meq/lit

t value for mean serum sodium levels is 2.237 and is statistically significant. The serum sodium level of cases is lower when compared to control group.

Glucose: **Table 6: Comparison of Glucose**

	Case	Control	Pooled	P Value
N	60	60	120	0.2
Mean	112.91	110.56		
SD	18.23	15.03		

- The mean glucose level in cases is 112.91 and the control group is 110.56 and the P value is not significant suggesting no relation between Febrile Seizures and Serum Glucose levels

C-reactive protein in cases:

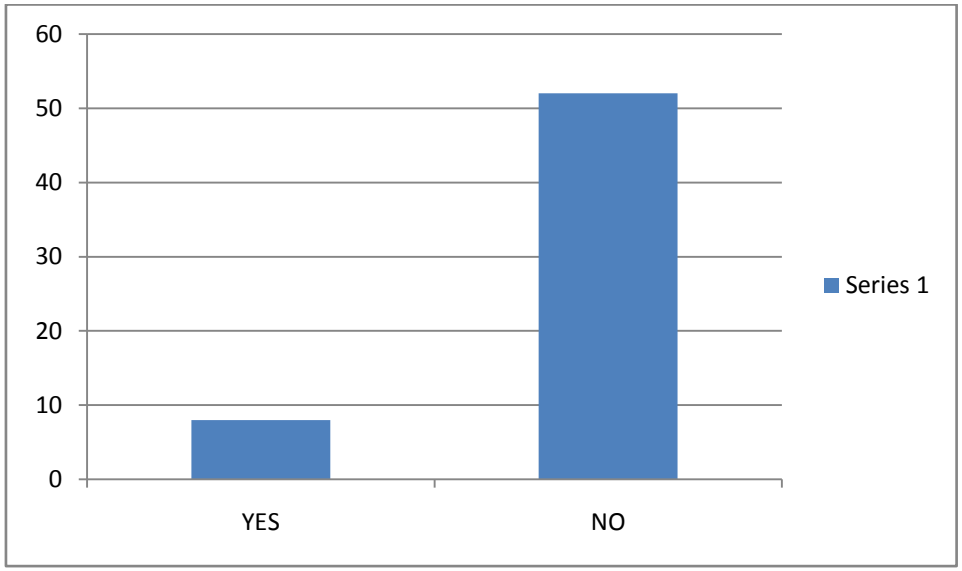

Fig 3: C-reactive protein in cases

Out of sixty cases CRP was positive in 8 children negative in 52 children. In controls CRP was positive in 7 children and negative in 53 children. There is no significant difference between cases and control.

IV. DISCUSSION

The Febrile Seizures are most frequently occurring in children between six months to five years of age (1) and the incidence is attributed to closer living arrangements among family members making detection more likely but racial and geographic variations may also be important.

In our study majority of the cases were males (58.3%) and most of the children presented were below two years. The risk of complex Febrile Seizures increases if the first fit occurs at a younger age. In our study 9 (15%) had complex Febrile Seizures out of them 6 (10%) occurred below one year. Al-Eissa et al in 1992(9) and Farewell et al in 1994(10) have also reported that age less than 12 months was related with increased incidence of complex Febrile Seizures. *Margriet et al* in their study demonstrated that children with simple Febrile Seizures have only slightly increased risk of developing recurrent a febrile seizures (epilepsy) between 1 and 1.5%. If febrile seizures are associated with complex seizures the risk of developing epilepsy later on increases.

If the child has a family history of epilepsy and has suffered focal febrile seizures, the estimated risk is 13%. Both the case and control group where age and sex matched so that there is not much difference to avoid age and gender bias. The mean age of case group is 24.51% $\pm$ 16.09 months and the mean age of controls was 24.83 $\pm$ 15.14 months. The percentage of males in case group is 58.3% and the percentage of males in control groups is 65%. There is not much difference and is not statistically significant.

The mean temperatures of the cases was 101.13 SD $\pm$ 0.18F and the mean temperature of children without Febrile Seizures was 102.20 SD $\pm$ 0.15F. There is no difference between temperatures of case and control groups.

The most common cause of fever in our study leading to Febrile Seizures was respiratory tract infections (30%). Rantala et al (8) in 1995 also reported in their study about upper respiratory tract infections.

In our study 13 (21.6%) children had positive family history of Febrile Seizures. Saidulhaque in 1981 (7) has reported 21% of children with positive family history in his study. In many families the disorder is inherited as autosomal dominant trait.

In our study most of the children 85% had simple Febrile Seizures. Around 9 (15%) children came with complex Febrile Seizures and these children were less than one year of age suggesting incidence of complex Febrile Seizures is higher among children presenting in less than one year of age.

The mean haemoglobin in case group 10.87 SD ± 1.57gm% and for control group is 11.69 SD± 1.53gm%. Out of sixty cases 25 (41.6%) had haemoglobin less than 11 gm%. t test for haemoglobin is 2.913 and is statically significant (p=0.0042). The haemoglobin levels were significantly lower in case group compared to control group.

Sodium plays an important role in neuronal cell depolarization, production of electric discharge and finally seizures. The need to evaluate and correlate serum sodium levels significant.

Saka K.Barzar M et al stated that serum sodium levels were 13.54 ± 4 meq/lit lower than control group 137.94 ± 2.92. There was statistically difference between the two groups ($p<0.001$).

T. Kiviranta, EM Airaksinen et al stated that sodium was lowest in children in repeated seizures and there is a risk of hyponatremia for multiple seizures during the same Febrile Illness.

C.A.C Hugen et al stated that the measurement of serum sodium is a valuable investigation in the child with Febrile Seizures. Lower the serium sodium level the higher the probability of a repeat convulsion.

In our study the mean serum sodium level in case is 135.91 and controls are 139.3 and the SD is 5.82 and 4.51 respectively and the p value obtained is significant.

In our study the mean glucose levels are 112.91 and 110.56 respectively and the p value obtained between case and control is not significant.

Valerio G et al Acta pediatric 2001 stated that there is prevalence of stress hyperglycemia in children with Febrile Seizures rather than hypoglycemia which is associated with bacterial meningitis.

In our study the mean serum calcium levels in cases and controls are 10.01 and 10.07 respectively and p value is not significant suggesting that there is no significant difference in serum levels of calcium in the case group and control group.

Sayed Zadeh S.A.; Hemati M did a study between level of calcium and occurrence of Febrile Seizures. Their study showed that serum calcium level in patients with Febrile Seizures is not significant.

Margriet van stuijivenberg 1998 proposed in their study that children presenting with Febrile Seizures measurement of CRP, leukocyte count and leukocyte differentiation are often performed to evaluate the source of fever. In their study stated that until recently children with Febrile Seizures underwent EEG either to diagnose epileptic activity or to assess the risk of Febrile Seizures recurrence. No evidence exists however that an abnormal EEG after the first Febrile Seizure is predictive for either risk of Febrile Seizure recurrence or epilepsy. The family history, duration and localisation of Seizure have more prognostic value than the EEG.

V. CONCLUSION

In this study majority of children were below two years of age and incidence of Febrile Seizures is higher in males which is 53.8%. The complex Febrile Seizures are observed below one year of age younger the age of presentation higher the chance of complex Febrile Seizures and there is a significant difference of serum sodium level between cases and controls.

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Dr.Sikha Maria Siromani"Neonatal Hyper Bilirubinemia in Level II NICU and its Outcome - A Tertiary Care Centre Experience." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 1, 2018, pp. 38-44