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Clinical Study of Febrile Seizures in Children Correlating With Laboratory Criteria

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Abstract
Background*: Febrile seizures are most common type of seizures occurring in 3 to 4% of children. Febrile seizures are to be differentiated from acute symptomatic convulsions which are caused by intracranial infection, Biochemical abnormalities (hypoglycaemia, hyponatremia, hypocalcaemia).*
Objectives: *to correlate laboratory parameters of children with fever and febrile seizures.*
Methodology: *case -control prospective observational study. The study was conducted over a period of 1 year from January 2014 to January 2015. Study population was composed of 120 children.60 were cases with febrile seizures and 60 were control group with febrile illness without seizures.*
Results*: 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 mean temperature of case group 101.13 SD ± 1.39 F, whereas mean temperature of control group is 101.2 SD± 1.21 F (p >0.05). 46(76%) cases were simple febrile seizures and 12(24%)were complex febrile seizures. The mean haemoglobin for case group is 10.87 SD ±1.577 gm% and mean haemoglobin for control group is 11.69SD±1.533 gm%(p<0.05). The mean serum sodium level in children with febrile seizures is 135.91meq/lit. The mean serum calcium in case group is 10.01(p<0.05). The Mean glucose level in cases is 112.91 and the mean glucose level in control group is 110.56 (p>0.05). CRP was positive in 8 (13%)children with febrile seizures.*
Conclusion*: statistical significance was found between haemoglobin level and serum sodium levels in children with febrile seizures.*
Keywords*: children, febrile seizures, laboratory parameters.*

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I. Introduction

The AAP (2008) defined Febrile Seizure as a seizure occurring in febrile children between the ages of 6 and 60 months who do not have an intracranial infection, metabolic disturbance, or history of afebrile seizure [(1)].Febrile Seizure occurs in 2% to 5% of children 6 months to 5 years of age. Febrile Seizure occurs more frequently in the Asian population, affecting 3.4%-9.3% of Japanese children and 5%-10% of Indian children, but only 2%-5% of children in the United States and Western Europe. The highest prevalence is 14% in Guam [(2)]. Most seizures were simple, and at least one complex feature was noted in approximately 35% of cases [(3)]. Both genetic and environmental elements contribute to their generation [(4)]. Upper respiratory infection was the most common precipitating factor [(5)].

II. Aims And Objectives

1. To study the common causes of fever provoking febrile seizures.
2. To Study risk of family history of febrile seizures, family history of epilepsy in children with febrile seizures.
3. To compare haemoglobin, serum sodium, calcium and glucose levels and CRP positivity and to find any significant difference of above lab parameters in children with febrile seizures and children with febrile illness.

III. Materials And Methods

It was a case -control prospective observational study. The study was done in the Institute of Child and Women Health, Niloufer Hospital, Osmania Medical College, Hyderabad. The study was conducted over a period of 1 year from January 2014 to January 2015. This study is a case control study done in department of paediatrics, Niloufer hospital, Osmania medical college, Hyderabad. Study population was composed of 120 children out of which 60 were caseswith febrile seizures and 60 were control group with febrile illness without

seizures. Ethics approval for the study was obtained from Hospital Ethical Committee. Written consent was taken from parents or attenders.

The inclusion criteria:

All paediatric patients with febrile seizures between age group of 6 months to 5 yrs, 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 and was associated with a fever of 100.4^0F or higher. control group was selected from age and sex matched children admitted with febrile illness of 100.4^0For more with out seizures

The Exclusion Criteria:

1. Children with CNS infection.
2. Any other defined cause of seizures.
3. Child with developmental delay.
4. Child on iron therapy.
5. Systemic metabolic abnormalities which produce seizures.
6. Neurological disorders.
7. Neurodegenerative Disorders.

A detailed history, general examination and systemic examination was recorded andnecessary laboratory investigations were done in both groups.

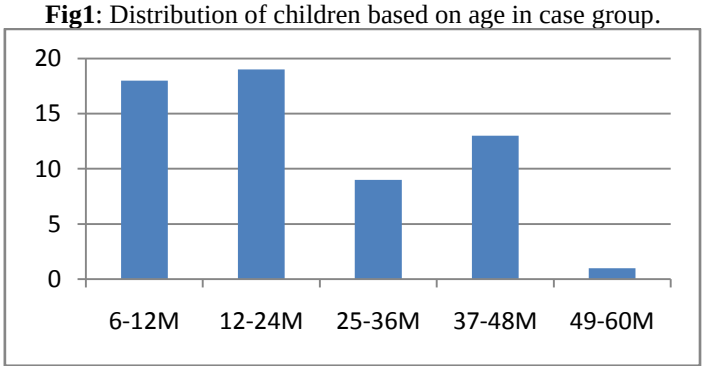
STATISTICAL ANALYSIS:

All the observations were recorded and master chart was then created in Microsoft Excel sheet. The qualitative values were transformed and were used for analysis. Statistical analysis was done using Windostat version 8.6 statistical analyser. Statistical data t test wasapplied.

IV. Results

The total no. of children in study (n)were 120 out of which 60 were cases and 60 were controls.
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.Majority of children (61%) presented were below 2 years of age (fig1)

Fig1: Distribution of children based on age in case group.



Out of 60 cases taken 58.3% were males and 41.6% were females, it was not statistically significant (table 1)

Table 1: Frequency distribution based on age and gender

Character	No	Age In M ± Sd	Male	Male%	Female	Female %
Case	60	24.51+/- 16.09	35	58.3%	25	41.66%
Control	60	24.83+/- 15.14	39	65%	21	35%

Most common precipitating factor for febrile seizure was upper respiratory tract infection (38%).other causes were viral pyrexia (28%), malaria (12%) and urinary tract infection (12%).

Out of 60 cases of febrile seizures 46(76%) cases had simple febrile seizures and 12(24%)had complex febrile seizures.

Out of 60 cases of febrile seizures 14(23%) cases had family history of febrile seizures where as in controls there are 4(6.6%) children had family history of febrile seizure. Statistical significant (p-<0.05) was seen between febrile seizures in children with family history of febrile seizures. There is family history of seizure disorder in 13% children of case group and in 8% children of control group.

The mean temperature has been correlated in both case and control group. Themean temperature of case group 101.13 SD ± 1.39^{o}F, whereas mean temperature of control group is 101.2 SD± 1.21^{o} F. The temperature of control group is slightly higher than the casgroup.t test had been applied to correlate both the case and control group and the results were not significant(table2).

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

	Case	Control	Pooled	SED	P Value
					0.7861
N	60	60	120		
mean	101.13	101.20	101.16	0.239	
SD	1.393	1.219	0.239		
Standard error	0.1799	0.1574			
T TEST	0.2719				

The mean haemoglobin for case group is 10.87 SD ±1.577 gm% and mean haemoglobin for control group is 11.69SD±1.533 gm%. t test had been applied to find out the statistical significance between the case and control group(p<00.5).

Table 3: Application of t test for case and control group haemoglobin gm%

	Case	Control	Pooled	SED	P Value
					0.0042
N	60	60	120		
Mean	10.871	11.698	11.285	0.283	
SD	1.577	1.530	0.283		
standard error	0.203	0.197			
T Test	2.193				

T value for haemoglobin is 2.913 and is statistically significant(p=0.0042). Thehaemoglobin levels were significantly lower in case group compared to control group. Out of 60 cases 25(41.6%) children had haemoglobin less than 11 gm% whereas 12(20%) children in controls had haemoglobin less than 11%(Table 3).

The mean serum sodium level in children with febrile seizures is 135.91meq/lit and the mean Serum sodium levels in controls is 139.3.T test had been applied to find out statistical difference between case and control group.T value for mean serum sodium levels is 2.237 and was statically significant. The serum sodium levels of cases were lower when compared to control group (table 4)

Table 4: 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 calcium levels have been correlated in both cases and control group. The mean serum calcium in case group was 10.01 and control group was 10.07 and the P value obtained was not significant suggesting that there is no significant relation between the febrile seizures and the levels of serum calcium(table5)

Table 5: Comparison of serum calcium levels in cases and controls

	MEAN	SD	P value
			0.34
Cases	10.018	0.674	
Controls	10.07	0.568	

The Mean glucose level in cases was112.91and the mean glucose level in controlgroup was 110.56andthePvalueobtainedby applying T test is not significant(table6)

Table 6: Comparison of blood glucose levels in cases and controls

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

Out of 60 cases CRP was positive in 8 (13%)children and negative in 52 children. In controls CRP was positive in 7 children and negative in 53 children. There is no significant difference between the cases and controls.

V. Discussion

Febrile convulsions are the most frequently occurring seizuresin children between 6 months and 5 years of age. In our study mean age of presentation was 24.51+/-16.09 months. In Abolfazl Mahyar [(6)] et al study mean age of presentation was23.38+/-12.14months. Out of 60 cases taken 58.3% were males and 41.6% were females, it was not statistically significant. There were studies that conclude a higher incidence of Febrile seizures in males [(7)] and others showed no significant difference based on gender [(8)]. In our study Out of 60 cases of febrile seizures 46(76%) cases were simple febrile seizures and 12(24%)were complex febrile seizures.In Anil Raj Ojha et al [(9)]study simple Febrile Seizures were seen in 80% of the cases and complex febrile seizures were seen in 20%.

In our study 23% cases had family history of febrile seizures. we found statistical difference between family history of febrile seizures and febrile seizure in children.Environmental factors and genetics elements had relation with onset of febrile seizures in families [(10)]. First- and second-degree relatives of children had been suffered more commonly with febrile seizures [(11)]. In many families the disorder is inherited as an autosomal dominant trait, and multiple single genes causing the disorder have been identified. In most cases the disorder appears polygenic and the genes predisposing to it remain to be identified.

In our study the mean temperature of cases was 101.13SD +/-0.18 ^{0}F and the mean temperature of children without febrile seizures was 101.20SD +/-0.15 F. There is no statistical difference between peak temperature of case and control groups.Animal studies suggest a possible role of endogenous pyrogens, such as interleukin 1beta which increases neuronal excitability and precipitate seizures. Studies support the hypothesis that the activated cytokine network may had a role in the pathogenesis of febrile seizures, but the precise clinical and pathological significance of these observations was not yet clear [(12,13,14)].

The most common cause of febrile seizures in our studywasupper respiratory tract infections (38%).other causes were viral pyrexia (28%), malaria (12%) and urinary tract infection (12%).As perAli Delpisheh et al recent upper respiratory infection 42.3% (95% CI: 37.2%–47.4%), gastroenteritis21.5% (95% CI: 13.6%–29.4%), and otitis media nfections15.2% (95% CI: 9.8%- 20.7%) respectively[(15)].Rantale et al in 1995 has also reported in their study upperrespiratory tract infections were common precipitating factor for febrile seizures.

In our study most of the children (85%) had simple febrile seizures. Around 9(15%) children came with complex febrile seizures. Among the children presenting with complex febrile seizures 6(68%) were less than 1 year of age suggesting that the incidence of complex febrile seizures is higher among the children presenting in less than 1 year of age.

On laboratory investigation the mean haemoglobin for case group was 10.87SD +/-1.577 gm% and the mean haemoglobin for the control group was 11.69SD +/_ 1.533 gm. Out of 60 cases 25 (41.6%) children had haemoglobin less than 11 gm. test 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. the low serum iron and presence of anaemia can serve as a reinforcing factor for the febrile seizure in children [(16,17,18)].

In our study 60 children the mean serum sodium levels in case was 135.91 and the mean serum sodium level in controls was 139.3and the P value obtained was significant. As sodium plays an important role in cell

physiology, production of electric discharge. Hence the need to evaluate and correlate serum sodium levels becomes significant. The American Academy of Paediatrics Practice Parameter, The Neurodiagnostic Evaluation of a Child with a First Simple Febrile Seizure, does not recommend serum electrolytes be obtained routinely. Two reports from Europe identified relative hyponatremia as a risk factor for febrile seizure recurrence within 24 hours [(19)]

In our study the mean glucose levels are 112.91 and 110.56 respectively and the P value obtained by applying t test between cases and controls was not significant. The subcommittee of American academy of paediatrics on febrile seizures stated that routinely serum glucose need not be measured but it has to be obtained if the child has a prolonged period of postictal obtundation.

In our study the mean serum calcium levels in cases and controls were 10.01 and 10.07 respectively and the P value obtained was not significant. Sayed Zadeh S et al studied to find the effect of serum calcium on febrile seizures between 2 groups of patients with simple and recurrence of febrile seizures within 24 hrs. Results of their study were mean calcium levels was 9.23+/-0.76mg/dl and 9.18+/-0.18 mg/dl in second group respectively. There was no significant difference of calcium levels in two groups. Their study confirmed that serum calcium level in patients with febrile seizures is not a predictor for recurrence of febrile seizures.

VI. Conclusion

Febrile seizures were common in children below 2 years of age (61%). simple febrile seizures were most common type of febrile seizures (80%).Complex febrile seizures are observed below1year of age (68%).Younger the age of presentation higher the chance of complex febrile seizures. Upper respiratory tract infection was the most common cause for fever and febrile seizure in children. Mean temperature in both groups was not statistically significance. Family history of febrile seizure was a significant risk factor for occurrence of febrile seizurein children. There is significant difference of serum sodium level between cases and controls so serum sodium level should be estimated in children with febrile seizure. Blood glucose levels, serum calcium and C-reactive protein did not significantly affect occurrence of febrile seizure.

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