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Serum Zinc Level In Children With Febrile Convulsions At Tertiary Care Hospital In Western Rajasthan

[1]Deepak Choudhary, [2]R.K.Soni, [3]Sandeep Kulhari

[1,3]Resident Doctor, [2]Senior Professor

Department of Paediatrics, S. P. Medical College & A.G. Of Hospitals, Bikaner, Rajasthan

Correspondence Author: Deepak Choudhary, Resident Doctor, Department of Paediatrics, S. P. Medical College & A.G. of Hospitals, Bikaner (Raj.)

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Abstract

Background- Epilepsy is one of the most common disorders of the brain. One of every ten people will have at least one epileptic seizure during a normal lifespan, and a third of these will develop epilepsy.

Methods- Hospital based Prospective, Analytical, Case – Control study conducted in Department of Pediatrics, S.P. Medical College and P.B.M Hospital, Bikaner

Results- Mean zinc level was 69.80±13.13mcg/dl and 80.76±10.24 mcg/dl in study and control groups respectively and this difference was found statistically highly significant ($p<0.001$).

Conclusion- Our findings revealed that serum zinc level was significantly lower in children with febrile seizure in comparison with children without seizure.

Keywords- Febrile Seizure, Children, Epilepsy.

Introduction

Epilepsy is one of the most common disorders of the brain[1]. One of every ten people will have at least one epileptic seizure during a normal lifespan, and a third of these will develop epilepsy. Worldwide, epilepsy affects 50 million people. According to a World Health Organization (WHO) survey, epilepsy accounts for 1% of the global burden of disease, a figure equivalent to breast cancer in women and lung cancer in men[2].

It is often said that due to their coenzyme activity and impact on ion channels and receptors, some elements have an important role in febrile seizures. Studies have shown that iron, zinc, magnesium, selenium and copper are highly effective in febrile seizures. Zinc is one of the essential minerals that plays the main role in treatment and prevention of neurological diseases.

The highest zinc concentration has been found in hippocampus. Zinc is an important factor for growth, evolution and normal function of the brain and a significant cofactor for DNA and RNA polymerase enzymes[19]. Zinc regulates the activity of glutamic acid and the rate-limiting enzyme (Glutamic acid decarboxylase) in the synthesis of gamma-aminobutyric acid (GABA) which is an inhibitory neuro-transmitter. This element also facilitates the inhibitory effect of calcium on N-methyl-D-aspartate receptors (NMDA) and by these effects prevents the stimulation of neuronal discharge.

High concentration of zinc exists in the synaptic vesicles of glutamatergic neurons including the hippocampal mossy fiber which can be synaptically released during neuronal activity as in convulsion[3-5]. As zinc plays important role in the functioning of nervous system, studies have shown that lack of zinc might have a role in pathogenesis of febrile seizures.

Materials and Methods

Study design

Hospital based Prospective, Analytical, Case – Control study.

Study duration

Twelve months (November 2016 to October 2017).

Study place

Department of Pediatrics, S.P. Medical College and P.B.M Hospital, Bikaner

Study population

Infants and children aged between 6 months to 5 years.

Sample size

100 patients were enrolled in the study out of which 50 were cases which were febrile convulsion patients and 50 were control who were age and weight matched children.

Selection of control

The control group included the age and weight matched children suffering from a febrile illness without seizures, such as urinary tract infection, gastroenteritis and respiratory tract infection, coming to P.B.M. children hospital.

Sampling Method

Convenience sampling

Inclusion Criteria

Children aged between 6 months to 5 years with simple/complex febrile seizures (seizure occurring in developmentally normal child in association with a febrile illness in the absence of CNS infection or any other defined cause of seizures).

Exclusion Criteria

1. Children with previous history of established non febrile seizures
2. Neurological infections (meningitis, encephalitis)
3. Hereditary metabolic disorders
4. Developmental delay
5. Children with history of birth asphyxia
6. Persistent neurological deficits

Data Collection

Demographic data, seizure details, nature of febrile illness, complete developmental history, family history of epilepsy/febrile seizures, temperature at admission, general examination, Systemic examination and nutritional status were recorded (IAP weight for age classification was used to grade protein energy malnutrition) including the final diagnosis was recorded.

Serum Zinc detection from blood was carried out in a PerkinElmer A-Analyst 800 tool atomic absorption spectrophotometry after diluting the serum 5 fold in 1/1000 priton.x.100 solution

Observations

Table 1: Distribution of Cases according to age group in both groups

Age Group (years)	Groups				Total	
	Study		Control			
	No.	%	No.	%	No.	%
<1	13	26.0	6	12.0	19	19.0
>1-2	19	38.0	27	54.0	46	46.0
>2-3	8	16.0	13	26.0	21	21.0
>3	10	20.0	4	8.0	14	14.0
Total	50	100	50	100	100	100
Mean	2.11		2.01			
SD	1.14		0.86			
t	0.529					
p	0.598NS					

According to above table, in study group, most common age group was >1-2 years where total 38% patients were found followed by <1 year, >3 years and >2-3 years where total 26%, 20% and 16% patients were found respectively. In control group again most common age group was >1-2 years where total 54% patients were found followed by 26%, 12% and 8% in age group >2-3 years, <1 year and >3 years respectively.

Mean age was 2.11±1.14 years and 2.01±0.86 years in study and control group respectively and this difference was found statistically insignificant (p>0.05).

Table 2: Distribution of Cases according to gender in both groups

Gender	Groups				Total	
	Study		Control			
	No.	%	No.	%	No.	%
Female	14	28.0	16	32.0	30	30.0
Male	36	72.0	34	68.0	70	70.0
Total	50	100	50	100	100	100
χ^2	0.190					
p	0.663NS					

In present study, male predominance over females in both study and control groups, where total 72% and 68% patients were males in study and control groups respectively. On applying chi square test, the difference was found statistically insignificant (p>0.05).

Table 3: Distribution of cases according to baby weight in both groups.

Baby Weight (kg)	Groups				Total	
	Study		Control			
	No.	%	No.	%	No.	%
<10	18	36.0	9	18.0	27	27.0
>10-15	24	48.0	34	68.0	58	58.0
>15	8	16.0	7	14.0	15	15.0
Total	50	100	50	100	100	100
Mean	11.64		12.24			
SD	2.85		2.40			
t	1.133					
p	0.260					

According to table 3, most of the babies had their weight >10-15 kgs, followed by <10 kg and >15 kgs in both study and control groups. Mean body weight was 11.64±2.85kg and 12.24±2.40 kg in study and control groups respectively and this difference was found statistically insignificant (p>0.05).

Table 4:Distribution of cases according to zinc (mcg/dl) level in both groups.

Zinc (mcg/dl)	Groups				Total	
	Study		Control			
	No.	%	No.	%	No.	%
Abnormal (<64)	18	36.0	5	10.0	23	23.0
Normal (64-124)	32	64.0	45	90.0	77	77.0
Total	50	100	50	100	100	100
Mean	69.80		80.76			
SD	13.13		10.24			
t	4.623					
p	<0.001					

According to above table, in study group, 18(36%) patients had abnormal (<64 mcg/dl) range of zinc level while in control group only 5(10%) had abnormal level.

Mean zinc level was 69.80±13.13mcg/dl and 80.76±10.24 mcg/dl in study and control groups respectively and this difference was found statistically highly significant (p<0.001).

Discussion

The present study was undertaken to assess the serum zinc status in febrile seizures – a prospective case control study at tertiary care hospital in Western Rajasthan, in the Department of Pediatric Medicine, Sardar Patel Medical College, Bikaner. In this Hospital based study 100 cases meeting the criteria were included and randomized equally into two groups: 50 cases and 50 controls. The control group included the age and weight matched children suffering from a febrile illness without seizures, such as urinary tract infection, gastroenteritis and respiratory tract infection coming to P.B.M. hospital.

In the present study out of total 50 study group patients, most common age group was >1-2 years where total 38% patients were found followed by <1 year, >3 years and >2-3 years where total 26%, 20% and 16% patients were found respectively. In control group again most common age group was >1-2 years where total 54% patients were found followed by 26%, 12% and 8% patients in age group >2-3 years, <1 year and >3 years respectively. Mean age in study group was 2.11±1.14 years while in

control group, it was 2.01±0.86 years and this difference was found statistically insignificant (p>0.05).

In a study done by Kumari et al[6], they found that 55.8% of cases and 56.5% of controls were in the age group less than 17 months. Guzman et al[7] found that 55% of children with febrile seizures were in age group 6 months to 24 months.

In present study, male predominance over females in both study and control groups where total 72% and 68% patients were males in study and control groups respectively. The difference was found statistically insignificant (p>0.05).

Regardless of the era of the study or particulars of the design, boys have consistently emerged with higher frequency of febrile seizures. Incidence ratios of boys: girls have ranged from 1.1:1 to 2:1 in the study conducted by Nelson and Ellenberg[8]. However present study finding are different in contrast to another set of large studies conducted by van der Berg et al[9], 1969 and Verity et al[10], 1985, who found no sex difference. Amir Salari also found no gender difference between cases and controls while NCPP study showed male predilection only among black population (Nelson and Ellenberg)[8]. Whether there is a biological basis for the gender-specific differences in febrile seizure susceptibility or whether boys just contract more fevers and therefore are at greater risk, is currently not established.

Zinc is a fundamental component of body enzymes that modulates CNS activities. CSF hypozinconemia activates N Methyl- D-aspartate receptors or disinhibits GABAergic action, thus resulting in febrile convulsion. In our study Mean zinc level was 69.80±13.13mcg/dl and 80.76±10.24mcg/dl in study and control groups respectively and this difference was found statistically highly significant (p<0.001). Similar findings were noted by others. Guzman et al[7] found that the mean serum concentration of magnesium and zinc were significantly lower in the children with febrile convulsion. In another study by Verity et al[10], researchers have shown that children with febrile convulsion had significantly higher plasma IL-1 beta and prostaglandin levels and lower serum zinc levels during the acute phase. They concluded that these changes may be responsible for the pathogenesis of febrile convulsion. In their study mean zinc levels were comparatively lower in FS group compared to FI group, but however it was statistically insignificant.

Conclusion

Our findings revealed that serum zinc level was significantly lower in children with febrile seizure in comparison with children without seizure.

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