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Original Article

Assessment of the Relation between Serum Zinc & Magnesium Levels in Children with Febrile Convulsion

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ABSTRACT

Background and Objectives: **Febrile convulsion is one of the most common types of seizure in childhood. Its pathogenesis is unknown, so studying its cause is valuable. The purpose of this study was to determine the serum level of zinc and magnesium in children with febrile convulsion (F.C) (3 months to 6 years age).**

Patients and Methods: **In this analytical case-control study, serum level of zinc and magnesium in 60 children with F.C in Shahid Beheshty Hospital of Kashan, center of Iran, was determined. The control group was composed of febrile children with no seizure. All children in both groups were 3 months to 6 yr of age and had not any background of disorders. Serum level of zinc & magnesium was determined by biochemical methods in all groups. Finally, the data were analyzed by SPSS and t test.**

Results: **The mean serum level of zinc and magnesium in case group, was lower than that of zinc & magnesium in control group ($P<0.05$). There was no relationship between sex, type and time of seizure with serum level of zinc or magnesium in children in case group.**

Conclusion: **There was a relationship between serum level of zinc & magnesium and the presence of F.C in children. So, it is suggested to use supplements of zinc and magnesium in diet of affected children for prophylaxis of febrile seizure recurrences.**

Keywords: Febrile Convulsion, Zinc, Magnesium, Children

Introduction

Febrile convulsion is one of the most common seizure disturbances in children with an approximate rate of 3 to 4 percent (1). Conceptually febrile convulsion is defined as seizure associated with fever as high as 38.5 °C in children 6 month to 5 years without any infection within the central nervous system (CNS) or other factors explaining its incident (2).

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The exact cause of febrile convulsion is unknown, but genetic and environmental factors have influence on its occurrence (3). Recent evidences indicate that the deficiency of trace elements such as zinc and magnesium can play a significant role in this regard (4, 5). Zinc is an element regulating the activity of glutamic acid decarboxylase which plays a role in producing γ–aminobotric acid, an controlling neurotransmitter, and also magnesium is a factor that is needed for enzymes that play role in cell membrane stability and never conduction, and hypomagnesaemia leads to never and muscle excitability (6, 7). Therefore it is assumed that the deficiency of these elements can have contributing effect in the incidence of febrile convulsion (4, 5) .

Considering the fact that febrile convulsion is a common problem within the country, specially, in the city of Kashan, center of Iran; this research was conducted to determine the association between the serum levels of zinc and magnesium as well as the incidence of febrile convulsion in children hospitalized in Shahid Beheshti Hospital, Kashan in 2006.

Material and Methods

This case control analytic research was performed on 120 children hospitalized in Shahid Beheshti Hospital of Kashan in 2006. A total number of 60 children, age of 3 months to 6 yr, afflicted to febrile convulsion were served as the cases whereas another 60 children within the same age range participated as the control group. The later group referred to the hospital as patients who merely suffered from fever. The participants were free of developmental and growth disturbances, plus all patients with febrile convulsion due to *Shigella* gastroenteritis were excluded from the study. The variable recorded for the study-included age, sex, kind and the length of seizure, the serum level of zinc and magnesium.

Following obtaining consent from the parents of children, 4 ml of blood sample was collected from every child and kept in acid washed test tube. The blood samples were centrifuged and their serum was separated and stored at -18 °C for measuring zinc and magnesium in the laboratory. The level of zinc was measured by employing Centerior kit made in Spain and BT3000 auto-analyzer. The level of magnesium was measured using pars Azmoon kit made in Iran and Autolab auto-analyzer.

Statistical analysis was performed by SPSS and independent *t*-test was used to compare the groups.

Results

61.7 % of children in case group were male. Overall, 91.7% of the seizure cases were identified as simple febrile convulsion. Two peaks in the frequency of febrile convulsion were observed, one peak occurred in age group 13 to 19 month old and the other was found in the age group of 25 to 37 month old. 53.3% children in case group in this study were under the age of 3 years. Table 1 presents the statistical characteristics of the subjects according to gender and age in month.

From the total of 60 children with febrile convulsion, 50 were referred for the first time, 9 patients came for the second time, and only 1 case was referred more than twice.

Table 1: Frequency of children with febrile convulsion (case) and children with fever without seizure according to age

Groups / Age (month)	Case		Control	
	Number	Percent	Number	Percent
3-13	8	13.3	19	31.7
13-19	17	28.3	11	18.3
19-25	6	10	4	6.6
25-37	15	25	8	13.35
37-49	7	11.7	8	13.35
49-72	7	11.7	10	16.7
Sum	60	100	60	100

The mean level of serum zinc in children with febrile convulsion was 116.28 mg /dl and 146.00 mg /dl in control group. This difference was statistically significant (*P*=0.003) .The mean level of serum magnesium in children with febrile convulsion was 2.21mg / dl and 2.39 mg / dl in control group. This difference was also statistically significant (*P*= 0.003).

No association was found between the zinc and magnesium level of children with febrile convulsion and their gender, or the occasions of seizure. Table 2 shows the statistical indices of serum level of zinc and magnesium in subjects according to the seizure type.

Table 2: Statistical indexes of serum zinc and magnesium levels according to Type of seizure in children with febrile convulsion

Element	Type of Seizure / Indexes	Number	Mean	SD	*P* value
Zinc	**Simple**	55	114.34	47.42	0.842
	Complex	5	137.58	62.53	
Magnesium	**Simple**	55	2.23	0.27	0.961
	Complex	5	2.01	0.2	

Discussion

In this study, it was found that serum level of zinc in children afflicted to febrile convulsion was significantly lower than the control group (*P*=0.003). Such finding was also reported earlier (4, 5, 8-10).

The results of the present study are in agreement with all the research conducted earlier about the lower serum level of zinc in children with febrile convulsion. Such findings may imply that a close association exists between the zinc deficiency and incidence of febrile convulsion in children.

In this study, the mean level of magnesium in children with febrile convulsion was significantly lower than the control group (*P*=0.003). This finding was also reported earlier (4, 10, 11).

In this research, the association between zinc and magnesium serum level in children with febrile convulsion with gender, type, duration or occasion was examined. The results of analysis showed that no significant association existed in this regard. No previous finding was reported by other studies.

Conclusion

Considering the significance differences between the levels of serum zinc and magnesium in children with febrile convulsion and children with fever without seizure, it may be concluded that there was a relationship between levels of serum zinc and magnesium and incident of febrile convulsion in children. Therefore, more research with larger sample size is suggested. In addition, it is suggested to conduct a study to determine the effect of consuming supplementary zinc and magnesium as preventive measure for febrile convulsion in children.

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