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FEBRILE SEIZURES;

SERUM ZINC LEVEL IN CHILDREN WITH REPORTING AT A TERTIARY CARE HOSPITAL OF SINDH

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ABSTRACT... Objectives: To determine the serum zinc levels in children with simple febrile seizures reporting at a tertiary care hospital of Sindh. **Study Design:** Cross sectional study. **Place and Duration:** Department of Paediatrics, Layari General Hospital Shaheed Muhtrama Benazir Bhutto Medical College from January 2015 to February 2016. **Methodology:** A sample of 120 children (60 cases and 60 controls) was selected through non- probability (purposive sampling) by pre defined inclusion and exclusion criteria. 3 ml venous blood was taken from a peripheral vein. Blood was process, centrifuged and sera were used for the analysis of serum zinc. Data of cases and controls was analyzed on Statistix 10.0 software (USA). P-value of ≤0.05 was considered statistically significant. **Results:** Age of controls and cases was noted as 13.68±8.74 and 15.75±9.11 months respectively and most common age group was 12 - 24 months in the cases. Male children predominated. Means± SD serum zinc was 79.03±24.17 and 62.82±14.66 in controls and cases respectively (P=0.0001). Low serum zinc was noted in 66.6% of cases compared to 40% in controls (P=0.0001). **Conclusion:** We noted low serum zinc levels in children with febrile seizures which may provoke febrile seizures. Children with low serum zinc levels are prone to febrile seizures

Key words: Febrile Seizure, Serum Zinc, Children.

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INTRODUCTION

A seizure is a paroxysmal event caused by sudden neuronal electrical discharge.[1] The febrile seizure are most often of generalized tonic – clonic type seizure provoked by high grade fever. Febrile seizures last for a few seconds to minutes; may be for 15 minutes rarely. Post-ictal drowsiness occurs for a brief period.[2] A frequency of 10% febrile convulsions was noted in the offsprings of families with febrile seizures.[3] A prevalence of 2-4% febrile seizures has been reported in the United Kingdom and United States, with recurrence of 30%.[4] Male children have double chance of febrile convulsions compared to the female children.[5,6] Febrile seizures do occur due to a neuronal tendency of immature brains to depolarize and fire spontaneously.[3,4] Children of 6 month to 3 years are the victims of febrile seizures, this accounts for 80- 85% of cases. Peak incidence occurs at 18 months of age.[1,7] Electrolytes and trace minerals play major role in the neuronal excitation. Zinc (Zn) is one of essential trace minerals. Trace minerals are reported play role in the induction of febrile seizures, exact mechanism of which is not clear; however, proposed mechanisms are the ionic channels and receptors stimulation and co-enzymes activity.[1] A previous study[8] reported role of magnesium, copper, zinc, selenium, iron etc in the febrile seizures. Phytates of cereals, bran, vegetables and seeds chelate the zinc, this contributes to zinc malabsorption.[9] Zn is stored in synaptic vesicles of glutamatergic neurons[10] and modulates the neuronal excitability.[11] Zn is a co-factor for glutamic acid decarboxylase (GAD).

GAD is involved in the synthesis of an inhibitory neurotransmitter the GABA. Low Zn may cause low GABA that may cause the neurons to fire spontaneously resulting in seizures. Previous studies[12,13] had reported low serum Zn in the febrile seizures. Zn has been a cofactor in the neurotransmitter synthesis and secretion.[4] Zn is essential for the synthesis of Pyridoxal phosphate (PP) which is a vital co-factor for neurotransmitter biosynthesis within the brain neurons.[12,13] The present cross sectional study was designed to determine the serum zinc levels in children with simple febrile seizures presenting at Pediatric Department of our tertiary care hospital.

MATERIAL AND METHODS

The materials for the present cross sectional study were collected from the Department of Paediatrics, Layari General Hospital Shaheed Muhtrama Benazir Bhutto Medical College from January 2015 to February 2016. Our Pediatric department is fully equipped with intensive care facilities to handle the cases of seizures. 60 cases and 60 controls of similar age and gender were selected through non-probability (purposive) technique according to inclusion and exclusion criteria. Inclusion criteria included; age 6 – 36 months, high grade fever, febrile fits and both male and female babies. Age <6 months and >36 months, premature babies, diagnosed cases of epilepsy, sepsis, diarrhoea and intake of zinc supplements were excluded. Neonates were also exclusion criterion. Strict scrutiny was exercised by researcher. Volunteer parents were informed about the purpose of blood sample collection. Informed written consent was signed by the heirs. Pre- structured proforma was designed for data collection. Children were managed clinically and properly. 3 ml venous blood was taken from a peripheral vein within six hours of a febrile seizure.[1] Blood was stored in acid washed glass tubes. Blood was process, centrifuged and sera were used for the analysis. Sera were diluted with distilled water (1:4). Zinc was measured by Randox Elisa kit (UK) on Hitachi chemistry analyzer. Readings were read at 213.9 wavelength absorbance.[14] Serum zinc level of 70–120 µg/dL was taken as reference value.[1,14] Data was kept confidential kept in lockers and authors were allowed to check the results. Institutional ethical approval for human research was taken before study. Study was followed the "declaration of Helsinki" for conducting the human research. Research variables were typed on Microsoft Excel sheet, followed by data entry in SPSS version 22.0 for windows (IBM, Incorporation, USA). Chi square and student`s t-tests were used for the analysis of continuous and categorical variables respectively. 95% confidence interval with α- level of $P \leq 0.05$ was considered statistically significant.

RESULT

Means± SD age of study controls and cases was noted as 13.68±8.74 and 15.75±9.11 months respectively (P=2073) (Table-I). Age categories are shown in Table-II. Common age group belonged to 6.1 to 12 months in controls and 12.1 to 24 months in the cases (P=0.821) (Table-II). Male to female ratio in control and cases was 2.52:1 and 3.61:1 respectively (P=0.26) (Table-III). Serum zinc shows significant deficiency in cases. Means± SD serum zinc was noted as 79.03±24.17 and 62.82±14.66 in controls and cases respectively (P=0.0001) (Table-IV). 66.6% of cases showed low serum zinc levels compared to 40% of controls (P=0.0001). (Table-V)

	Controls	Cases	P-value
Age (months)	13.68±8.74	15.75±9.11	0.2073

Table-I. Age distribution of study subjects (n=120)

	Controls	Cases	P-value
6 months	13 (21.6%)	14 (23.3%)	0.821
6.1- 12 months	17 (28.3%)	15 (25.0%)	
12.1- 24 months	15 (25.0%)	17 (28.3%)	
24.1 -36 months	15 (25.0%)	14 (23.3%)	

Table-II. Age distribution of study subjects (n=120)

	Controls	Cases	P-value
Male	43 (71.6%)	47 (78.3%)	0.26
Female	17 (28.3%)	13 (21.6%)	
Total	60 (100%)	60 (100%)	

Table-III. Gender distribution of study subjects (n=120)

	Controls	Cases	P-value
Serum Zinc (µg/dl)	79.03±24.17	62.82±14.66	0.0001

Table-IV. Serum zinc levels in study subjects (n=120)

Controls		Cases		P-value
Normal Zinc	Low Zinc	Normal Zinc	Low Zinc	0.0001
36 (60%)	24 (40%)	20 (33.3%)	40 (66.6%)	

Table-V. Frequency of normal and low zinc (n=120)

DISCUSSION

The present is the first report on the determination of serum zinc levels in the children with simple febrile seizure presenting at our tertiary care hospital. Sixty cases and sixty age and gender matched controls were studied and results were analyzed and interpreted for the serum zinc levels. Febrile seizures are very common in young children with high grade fever, but its pathogenesis is not elucidated.[1] Proposed factors responsible for their occurrence include the iron and zinc deficiency, familial tendency, and genetic factors. Certain cytokines released during high grade fever such as the interleukin-1 (IL-1), interleukin-6 (IL-6) and tumor necrosis factor alpha (TNF-α) may decrease the serum zinc levels through unknown mechanisms. Low zinc has been suggested as a pathophysiological change during high grade body temperature.[1,15] The present study reveals low zinc levels in childhood febrile seizures which are in agreement with above studies.[1,15] Our study population included young babies of below 3 years according to the inclusion criteria. Age observed in the present study for the controls and cases was noted as 13.68±8.74 and 15.75±9.11 months respectively (P=2073) (Table-I). The finding is supported by previous studies by Pannerselvam et al[16] and Hartfield et al[17] as they reported mean age of 17.9 months. In present study, the mean age in cases was 15.75±9.11 months, which are in agreement with above studies. In present study, the common age group was 6.1 to 12 months in controls and 12.1 to 24 months in the cases (P=0.821) (Table-II), these findings are in agreement with previous studies.[16,17] Hartfield et al[17] majority of their children with febrile seizures belonged to age < 24 months with 17.9 months. This supports the findings of present study. However, the present study included children upto 36 months that is not in agreement with above studies.[16,17] A previous study[18] 17 months of age in 25.8% of cases and 56.5% of controls; the findings are in keeping with the present study. In present study 25% children belonged to 12- 24 months age, this is in full agreement with above study. Guzman et al[19] and Pannerselvam et al[16] observed 55% of their study population belonged to the age 6 - 24 months, this in support to the present study. In present study 53.3% children belonged to the 6 - 24 month age group. In the present study, the male to female ratio noted in control and cases as 2.52:1 and 3.61:1 respectively (P=0.26) (Table-III). Male predominance of present study is higher compared to previous studies.[16,20] Pannerselvam et al[16] reported 66% were males and M:F ratio was 1.9:1. These findings are in agreement with our present study. However, Kumara et al[21] showed no male predominance that is in disagreement with present and previous studies.[16,20] The results of this study determined low serum zinc in febrile seizures compared to controls. The finding of low serum zinc in febrile seizures is also supported by previous studies.[16,20,22,23] The present study had a simple objective of just determining the serum zinc levels in simple febrile seizure that was found true. The present study has certain limitations, such as the; small sample size, particular ethnicity, and other factors were not analyzed which might affect the serum zinc levels. The cause effect relationship could also be not concluded because of cross sectional study. However, the finding of low serum zinc in febrile children is a worth finding that should be considered while treating this particular disease population.

CONCULSION

The present study reports low serum zinc levels in children with febrile seizures. Children with low serum zinc levels are prone to febrile seizures. The finding of low serum zinc in febrile children is a worth finding that should be considered while treating children in the pediatric emergency wards. Further large scale studies are needed to establish clinical correlation of serum zinc and febrile seizures.

REFERENCES

1. Rabbani MW, Ali I, Latif HZ, Basit A, Rabbani MA. **Serum zinc level in children presenting with febrile seizures.**

Pak J Med Sci 2013; 29 (4):1008-1011.

2. Prasad DKV, Shaheen U, Satyanarayana U, Prabha TS, Jyothy A, Munshi A. **Association of Serum Trace Elements and Minerals with Genetic Generalized Epilepsy and Idiopathic Intractable Epilepsy.** Neurochemical Res 2014; 38 (12): 2370–2376.

3. Wojciak RW, Mojs E, Stanislawska- Kubiak M, Sambroski W. **The serum zinc, copper, iron and chromium concentrations in epileptic children.** Epilepsy Re 2013; 104 (1): 40- 44.

4. Offringa M, Newton R, Cozijnsen MA, Nevitt SJ. **Prophylactic drug management for febrile seizures in children.** Cochrane Database of Systematic Reviews 2017; Issue 2. Art. No. CD003031:1-4.

5. Ehsanipour F, Talebi-Taher M, Harandi NV, Kani K. **Serum zinc level in children with febrile convulsion and its comparison with that of control group.** Iran J Pediatr 2009; 19:65-68.

6. Vestergaard M, Obel C, Henriksen TB, Christensen J, Madsen KM, Ostergaard JR. **The Danish National Hospital Register is a valuable study base for epidemiologic research in febrile seizures.** J Clin Epidemiol 2006; 59:61-66.

7. Waruiru C, Appleton R. **Febrile seizures: an update.** Arch Dis Child. 2014; 89:751–756.

8. Farahani Heidar N, Ashthiani Alireza R, Masihi Mher S. **Study on serum zinc and selenium levels in epileptic patients.** Neurosciences 2013; 18(2):138–142.

9. Saad K, Hammad E, Hassan AF, Badry R. **Trace element, oxidant and antioxidant enzyme values in blood of children with refractory epilepsy.** Int J Neurosci 2014; 124(3):181–186.

10. Shaheen Uzma, Prasad DKV, Vandana Sharma, Suryaprabha T, Ahuja YR, Jyothy A, Munshi A. **Significance of MDR1 gene polymorphism C3435T in predicting drug response in epilepsy.** Epilepsy Res 2014; 108:251–256.

11. Mollah MA, Dey PR, Tarafdar SA, Akhter S, Ahmed S, Hassan T, et al. **Zinc in CSF of patients with febrile convulsion.** Indian J Pediatr 2002; 69(10):859-61.

12. Mishra OP, Singhal D, Upadhya RS, Prasad R, Atri D. **Cerebrospinal fluid zinc, magnesium, copper and gamma aminobutyric acid levels in febrile seizure.** J Pediatr Neurol 2007; 5:39-44.

13. Srinivasa S, Manjunath MN. **Serum zinc levels in children with febrile seizures.** J Evol Med Dent Sci 2014; 3(12):2983–8.

14. Perkin R, Elmer C. **Analytical methods for atomic absorption spectroscopy.** The Perkin Elmer Corporation, USA 1996: 5–6.

15. Burhanoglu M, Tutuncuoglu S, Coker C, Tekgul H, Ozgur T. **Hypozincaemia in febrile convulsion.** Eur J Pediatr 1996; 155:498-501.

16. Karthikeyan P, Prasanna R, Sathyamoorthy M, Reddy SM, Sekar P. Serum **zinc levels in children with simple febrile seizures.** Int J Contemp Pediatr 2015; 2:424-7.

17. Hartifeld DS, Tan J, Yager JY, Rosychuk RJ, Spandy D, Haines C, et al **The association between iron deficiency and febrile seizure in childhood.** Clin Pediatr 2009; 48(4):420-6.

18. Akbayram S, Cemek M, Buyukben A, Aymelek F, Karaman S, Yilmaz F, et al. **Major and minor bio-element status in children with febrile seizure.** Bratisl Lek Listy 2012; 113(7):421–3.

19. Guzman AR, Castillejos EL, Vicuña WL, Laguia VL, Balarezo W, Gurreoner RL. **Anemia: a possible risk factor for the first febrile seizure.** Paediatrica 2005; 7(2):62-5.

20. Ganesh R, Janakiraman L. **Serum zinc levels in children with simple febrile seizures.** Clin Pediatr 2008; 47:164-6.

21. Kumari PL, Nair MKC, Nair SM, Lalitha K, Geetha S. **Iron deficiency as a risk factor for simple febrile seizures - a case control study.** Indian Pediatr 2012; 49 17-1.

22. Kumar L, Chaurasiya OS, Gupta AH. **Prospective study of level of serum zinc in patients of febrile seizures, idiopathic epilepsy and CNS infections.** People's J Sci Res 2011; 4:1-4.

23. Khajeh A, Miri-Aliabad G, Fayyazi A, Safdari Z, Keikha M, Askari H. **Serum zinc level in children with febrile convulsion.** Zahedan J Res Med Sci. 2016 January; 18(1):e5881.

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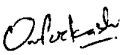
2	Omperkash	Literature review, concept, Materials handling, Interpretation lab investigations, Manuscript write up, Proof reading.	
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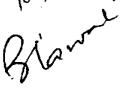
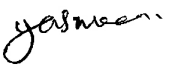
4	Bilawal Hingorjo	Concept, Materials handling, Collections of materials, Compilation of results, Statisitcal analysis, Manuscript write up.	
5	Yasmeen Kazi	Interpretation lab investigations, Manuscript write up, Proof reading.	
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