

Correlation of Serum Iron And Serum Calcium Level In Children With Febrile Convulsion

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Abstract

Background: Objective of this study is to correlate iron deficiency anaemia and hypocalcaemia in children with febrile convulsion.

Methods: In this case study 50 cases and 50 control with and without seizures were taken and serum iron and serum calcium level was determined in both groups.

Results: Mean haemoglobin of case was 9.14gm% and control was 9.54 gm% with a p value of 0.003 being statistically significant. Mean serum ferritin level in case was 42.11mg/dl and is statistically significant with p value of 0.01. Mean value of serum calcium was 9.5 mg/dl which is insignificant.

Conclusion: There is positive association between iron deficiency anaemia and febrile seizure and it should be excluded in children with febrile convulsion. However calcium deficiency is not associated with febrile convulsion.

Date of Submission: 04-10-2019

Date of Acceptance: 21-10-2019

I. Introduction

Febrile convulsion are commonest convulsion occurring between 6 months to 5 years of age without any CNS infection. Incidence of febrile convulsion is 4.8/1000 children per year. There have been several studies but pathophysiology is still not known.

Iron deficiency anaemia is the commonest micronutrient deficiency worldwide and more common in 6 – 24 months of age and it is preventable and treatable too.

In developing countries 50% of preschool children have anaemia and most commonly iron deficiency anaemia.

Iron is required not only for haemoglobin synthesis but also for myelin formation, brain energy metabolism, and neurotransmitter and enzyme metabolism.

In iron deficiency anaemia neurological symptoms like poor attention span, learning difficulties, poor memory, delayed motor development, behaviour problem may occur.

Most studies have shown iron deficiency as predisposing factor for development of febrile convulsion but some studies suggest less association, since results are conflicting there is need of more studies.

Common biochemical abnormality causing febrile convulsion is hypocalcaemia which manifests as muscular cramps, seizures, tetany and paraesthesia.

During febrile illness there is electrolyte imbalance which may lead to hypocalcaemia and might cause seizures.

II. Methods

This is a case control study conducted in a podiatric ward of a tertiary hospital, Ranchi over a period of 1 year. 100 children were included in this study and divided into 2 groups.

GROUP A - Children with febrile convulsion (n= 50)

GROUP B - Children with fever without convulsion (n = 50)

INCLUSION CRITERIA:

Children between 6 months to 5 years, who are haemodynamically stable.

EXCLUSION CRITERIA:

Any CNS infection or other cause of seizure.

Iron deficiency is defined as Hb_{gm}% < 11gm

MCV < 70 FEMLOLITER

MCH < 27 pg.

Serum ferritin < 12 micro gm/dl

Hypocalcemia defined as serum calcium < 8.5 mg/dl.

III. Results

Mean age of case and control are 21.47 ± 14.24 and 31.72 ± 20.99 months respectively. Cases were more common in males. Etiology of fever most commonly URTI with p value of 0.112 which is insignificant in cases whereas LRTI and AGE are common in controls. Mean temperature in case was 38.9 ± 0.48 centigrade and in control was 38.7 ± 0.31 centigrade. The mean value of haemoglobin, MCV, MCH are low in cases compared to control with significant "p" value. Serum ferritin in cases are 42.11 ± 30.46 and in control 54.97 ± 25.26 with a 'p' value of 0.01 which is significant. Serum calcium level in cases is 9.25 ± 0.63 and in control is 9.12 ± 0.54 with a p value of 0.128 which is insignificant. 17% of the cases and 7% control have iron deficiency anaemia with a p value of 0.029 which is significant. 10% of cases and 6% control have hypocalcemia with a p value of 0.298 which is insignificant.

: Demographic data for both cases and controls			
Parameter	Cases	Controls	P value
Age (months)	21.7	31.72	
Males	61	56	0.473
Females	39	44	
Etiology of fever (%)			
URTI	66	55	0.122
LRTI	25	26	0.871
AGE	9	19	0.01
Temperature (°C)	38.9 ± 0.48	38.7 ± 0.31	0.001

Comparison of blood parameters.

Parameter	Cases Mean \pm SD	Controls Mean \pm SD	value	p value
Hemoglobin	9.14 ± 0.85	9.54 ± 0.98		0.003
MCV	65.99 ± 5.33	84.01 ± 13.74		0.000
MCH	25.39 ± 3.09	37.06 ± 9.68		0.000
RDW	15.12 ± 1.14	14.17 ± 1.13		0.000
Serum ferritin	42.11 ± 30.46	54.97 ± 25.26		0.01
Serum calcium	9.25 ± 0.63	9.12 ± 0.54		0.128

IV. Discussion

Febrile convulsion most commonly occurs between 6 months to 5 years of age. Its association with iron deficiency anaemia is explored all over the world. Iron has important role in neurological function like myelin formation, neurotransmitter metabolism, and brain energy metabolism. However there is controversy between iron deficiency anaemia and febrile convulsion association. Febrile illness causes electrolyte imbalance like hypocalcemia and causes seizures. Mean age of onset is 21.74 ± 14.24 months in cases and 31.72 ± 20.99 months in control. 61% males were affected and 39% females with male preponderance. In present study in cases AGE, URTI, LRTI account for 9%, 66%, 25% respectively and in control frequency was 19%, 55%, 26%.

Study by Kumari et al. defined iron deficiency as Hb $< 15\%$ and found that iron deficiency is more common in cases with $P=0.001$ with adjusted odds ratio of 4.5 (95% CI), findings similar to present study concluding that highly significant association was found between iron deficiency and simple febrile convulsions. Pisacane et al in a study, also had anaemia, significantly more common in cases (30%) than hospital controls (14%) with OR 1 (CI-2.6;1.4-4.8) opining that fever can worsen negative effect of anaemia and seizure can occur as a consequence. Studies by Sherjil et al. and Hartfield done to correlate iron deficiency anaemia and febrile seizures, concluded that children with iron deficiency anaemia are twice likely to develop seizures than children with febrile illness alone. Study by Daoud et al who evaluated iron status in 75 children with febrile seizures, reported the following in cases: Low Hb-10.6 gm%, with $P=0.27$; Low MCV 73.3, with $P=0.36$; Low MCH of 25% with $P=0.26$. All the above values were statistically insignificant, probably due to

less sample size. Similar results found in present study but statistically significant. Whereas plasma ferritin, which is the best measure of iron status in the body, was also reported; mean value of which was 29.5 microgm/dl with a P value of 0.0001, significantly higher proportion of cases had low serum ferritin. In present study too low serum ferritin was found with a P value of 0.029. They concluded that, lower plasma ferritin is associated and may play a role in febrile seizures. Naveed-ur-Rehman et al. & Billoo, Vasvani et al., Jun et al., Saeed et al., Fallah et al. also found low serum ferritin, Hb, MCV

V. Conclusion

This study suggest that there is considerable percentage of children having febrile convulsion suffering from iron deficiency anaemia and it needs to be excluded. However hypocalcemia is not associated with febrile convulsion.

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Dr. Prita Naaz Dubraj. "Correlation of Serum Iron And serum Calcium Level In Children With Febrile Convulsion." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 10, 2019, pp 06-08.