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Original Research Article

Study of iron deficiency as a risk factor for first episode of simple febrile siezure

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ABSTRACT

Background: Febrile seizure are seizure that occur between the age of 6 month to 60 months with a temperature of 100.4f or higher, that are not the result of central nervous system infection or any metabolic imbalance and that occur in the absence of a history of prior afebrile seizure. Febrile seizures are the commonest cause of seizures in children, occuring in 2-5% of children. The maximum age of febrile convulsion occurrence is 14-18 months, which overlap with the maximum prevalence of iron deficiency anaemia which is 1-2 year old. 7 So far, the dilemma of cause of febrile seizure could not be solved. Standard text book still mention iron deficiency is associated with an increased risk of febrile seizure, thus screening for that problem and treating it appears appropriate.
Methods: This case control study was done from June 2015 to December 2016. 60 cases of first episode of simple febrile seizure in age group of 6 month to 5 years were included in the study. A control group was selected from age and sex matched children admitted with febrile illness but without seizure. In all cases detailed clinical history, anthropometry, clinical sign of iron deficiency, CNS examination, CBC, PBF, Red cell indices, serum iron, serum ferritin and serum TIBC level was done. These were analysed in three groups mild, moderate, severe deficiency of anemia. A clinical correlation is tried to establish between overt and subtle iron deficiency with seizure.
Results: Majority of subjects with first episode of simple febrile seizure were males (63.3%). Majority of cases of febrile seizure occur in the 6-24 months age group (83.3%). Incidence of anemia among case group subjects was 90.0% whereas the same in control group was 30 %. Mean RDW and TIBC levels in cases were significantly higher as compared to that in controls. MCV, Mean Serum ferritin and Serum Iron levels in cases were significantly lower as compared to that in controls.
Conclusions: The findings in present study established an association between iron deficiency anemia and first episode of simple febrile seizures.

Keywords: MCV, RDW, Simple febrile seizure, TIBC

INTRODUCTION

Febrile seizures are seizures that occur between the age of 6 month to 60 month with a temperature of 100.4f or higher,that are not the result of central nervous system infection or any metabolic imbalance and that occur in the absence of a history of prior afebrile seizure. Febrile seizures are the commonest cause of seizures in children, occuring in 2-5% of children.[1] Complications like aspiration can occur during each episode of seizures.[2-5] Febrile seizure episodes are agonizing to the parent and child and can cause psychological trauma to both.[6] The

maximum age of febrile convulsion occurrence is 14-18 months,which overlap with the maximum prevalence of iron deficiency anaemia which is 1-2 year old.[7] So far the dilemma of cause of febrile seizure could not be solved. Standard text book still mention iron deficiency is associated with an increased risk of febrile seizure, thus screening for that problem and treating it appears appropriate. Numerous studies with conflicting result have been done on iron deficiency anemia and febrile seizure. Although the results are conflicting, some reports suggest an increased prevalence of febrile seizures in iron deficient children.[8-10]

We also attempted to find out the correlation between iron deficiency and first episode of simple febrile convulsion by our present study. For this study, we designed a case control study in which serum iron, ferritin, TIBC (iron metabolic markers) are studied in cases of first episode of simple febrile seizure.

METHODS

The present study was carried out at Department of Pediatrics, JLN medical college, Ajmer from June 2015 to December 2016.

The study is designed as case control study included 60 cases of first episode of simple febrile seizure in age group of 6 month to 5 years admitted to pediatric ward. A control group was selected from age and sex matched children admitted with febrile illness but without seizure. Simple febrile seizure was taken as per criteria led down as follows.[1]

- Age between 6 months to 60 month
- Temperature of 38 degree Celsius (104.4F) or higher
- Not the result of central nervous system infection or any
- Metabolic imbalance
- Occur in the absence of a history of prior afebrile seizure.
- Primarily generalized, usually tonic – clonic
- Lasting for a maximum of 15 min.
- Not recurrent within a 24 hrs period.

In all cases detailed clinical history, anthropometry, clinical sign of iron deficiency, CNS examination was done.

In all these cases CBC, PBF, Red cell indices, serum iron, serum ferritin and serum TIBC level was done. These were analysed in three groups mild, moderate, severe deficiency of anemia

Exclusion criteria

- Children with neurological infection.
- Children with developmental delay.
- Children on iron therapy.
- Children with previous febrile/afebrile seizure.

Data Collection

Haematological

- Hemoglobin- (Cyanmethemoglobin method)
- MCV, MCH, RDW - (Haematology analyzer)
- Serum Ferritin – (ELISA Method)
- Serum Iron – (Biochemical method based kit)
- TIBC – (Biochemical method based kit)
- Peripheral blood smear

Anthroprometry

- Weight was recorded on an electronic type of weighing scale. The weight of the child was measured in nude or minimal light clothing. The weighing scale was having minimum units of 100 gms.
- For measuring length and height infantometer and stadiometer is used respectively. Two peoples are required for measuring of length. Length is recorded for children under 2 years of age. The child was placed supine on an infantometer. The head is held firmly in position against a fixed upright head board. Legs are straightened, keeping feet at right angles to legs with toes pointing upwards. The free foot board is brought into firm contact with child heels. Length of the child is measured from a scale, which is set in infantometer.
- For standing height, the child stands upright. Heels are slightly separated and the weight is borne evenly on both feet. Heels, buttocks and back are brought in contact with vertical surfaces on stadiometer. The head is so positioned that the child looks directly forwards with the Frankfurt plane (the line joining floor of external auditory meatus to the lower margin of orbit) and the biauricular plane being horizontal. The head piece is kept firmly over the vertex to compress the hair. The measurement of height is then recorded.
- Head circumference was measured using a plastic tape measure by cross tape method. Using non stretchable tape the maximum circumference of the head from the occipital protuberance to the supraorbital ridges on the fore head is recorded.
- IAP weight for age classification was used to grade protein energy malnutrition.

RESULTS

Majority of subjects with first episode of simple febrile seizure were males (63.3%). Majority of cases of febrile seizure occur in the 6-24 months age group (83.3%). Febrile seizures are age dependent and this age should be regarded as critical for developing febrile seizure. The mean of temperature was found to have difference between cases and control but it was not statistically

significant (p value = 0.412). Majority of subjects in both case group (80%) and control group (83%) had normal nutritional status or adequate dietary status.

Incidence of anemia among case group subjects was 90.0 % whereas the same in control group was 30%. This association was statistically significant (p <0.01). Mean RDW and TIBC levels in cases were significantly higher as compared to that in controls (p<0.01). MCV, mean serum ferritin and Serum Iron levels in cases were significantly lower as compared to that in controls (p <0.05). Low serum iron levels and Serum ferritin were significantly associated with risk of first episode of febrile seizures (p<0.01).

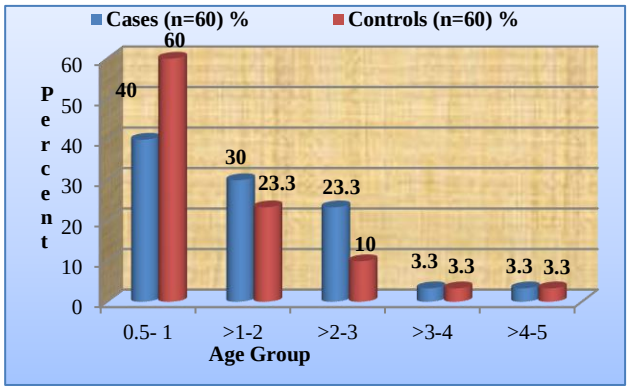

Figure 1: Age-wise distribution of Cases and Controls.

A total of 42 (70%) patients in case group and 50 (83.3%) in control group were aged upto 2 years. Mean age of patients being 21.48±13.51 months and 17.13±13.65 months in cases and controls respectively with no statistically difference (p=0.192).

Table 1: Distribution of cases according to haemoglobin levels.

Hemoglobin Levels (gm/dl)	Cases (n=60)		Controls (n=60)	
	No.	%	No.	%
No anemia (≥11)	6	10.0	42	70.0
Anemia (<11)	54	90.0	18	30.0
χ^2=8.012.00 (df=1); p<0.01				
Mild anemia (10-10.9)	18	33.3	8	44.4
Moderate anemia (7.0-9.9)	34	63.0	8	44.4
Severe anemia (<7)	2	3.7	2	11.2
χ^2=12. 336 (df=2); p<0.01				

Table 1 shows that 90 % (n=54) children had Hb <11 gm/dl from the case group as compared to 30 % (n=18) in control group with significant p value (p <0.01). Proportion of cases with anemia (90%) was significantly higher as compared to that of controls (30%) (p=0.013). It was further observed that 69.7% (n= 36) in case group.

Table 2: Hematological parameters.

Parameter	Cases (n=60)		Controls (n=60)		Significance of difference	
	Mean	SD	Mean	SD	t	p
Hb (gm/dl)	9.35	1.74	10.79	1.51	3.412	<0.01
MCV (fl)	69.06	15.16	73.79	9.84	2.008	<0.05
MCH (pg)	22.71	5.55	24.95	5.88	1.858	0.068
RDW	18.23	6.67	16.3133	2.56082	2.077	<0.05

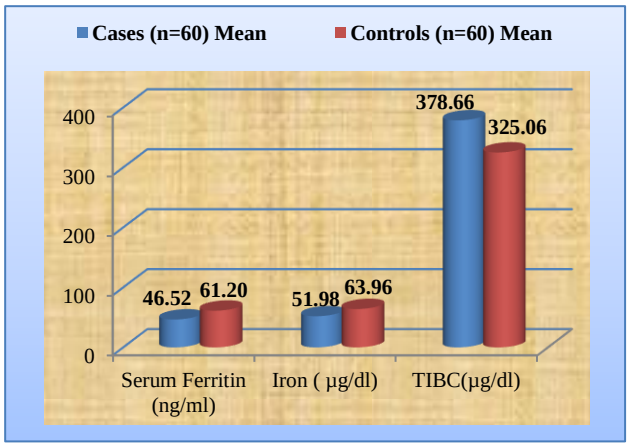

Figure 2: Mean level of iron metabolic markers in cases and controls.

Table 2 shows, mean haemoglobin level and MCV in cases were significantly lower as compared to that in controls (p <0.05). RDW value is significantly higher in cases as compared to control (p <0.05). No significant difference between two groups was observed with respect to mean MCH levels (p >0.05).

Graph shows serum ferritin and serum iron levels in cases were significantly lower as compared to that in controls (p <0.01). TIBC value is significantly higher in cases as compared to control (p <0.01).

DISCUSSION

A total of 120 subjects were included in the study. Case group comprised of 60 children admitted with first episode of simple febrile seizure and 60 children in

control group of the matched age-gender with febrile illness but without seizures and without iron supplements.

In the present study, the majority of cases (83.3%) of simple febrile seizure (FS) occurred in 6-24 months age group only (graph 1). This is in accordance to study by Leela Kumari et al, Vaswani et al and AL-Zwaini et al.[11-13] Febrile seizures are age dependent and age group of 6-24 months is regarded critical for developing febrile seizure.

In the present study, majority of subjects in both the groups were males. Sex analysis reveals that 70% were males and 30% females in case group. Leela Kumari et al also reported 53% male children in their study.[11] In present study 36.6% of our cases were found to have family history of Febrile seizures which has statistical significance from control group (p=0.03). This finding is in agreement with Daoud et al, Kugler et al, Doose et al that showed strong evidence of a positive family history as a risk factor for Febrile seizures.[14-16]

In present study characteristics studied were temperature, weight (Kg), height (Cm), nutritional status among which mean of temperature was found to have difference between cases and control but was not statistically significant (p value = 0.412). This is in accordance to study by Modaresi M et al, Vaswani et al and Daoud et al who although reported a higher incidence of high temperature in case group but it was not statically significant.[12,17,18]

The incidence of anemia was higher among cases (90 %) as compared to controls (30%). This difference was statistically significant (p<0.01). Other workers of field as Derakhshanfar et al and Modaresi M et al also reported statistically significant difference from control group.[18,19]

We measured iron status components (Hb, MCV, MCH, RDW, serum iron, ferritin and TIBC) among cases and controls. In the present study, we found that the mean ferritin and serum iron level in the FS group were significantly lower than the corresponding levels in the control group (p < 0.01). Daoud et al reported that the mean level of ferritin in cases with first febrile seizure is significantly lower than that in a control group.[17] Pisacane et al compared the levels of serum iron among controls and patients with FS, and they reported that iron deficiency anemia is significantly more frequent among the cases than among the controls.[8]

CONCLUSION

In conclusion Iron deficiency - a modifiable risk factor for first episode of simple febrile seizures in Indian children of age group 6 months to 5 years. Early detection and timely correction o f iron deficiency may be helpful for prevention of simple febrile seizure in children of this age group.

Considering the high incidence of iron deficiency anemia in population this study is relevant. It opens up new possibilities of prevention of febrile seizures by simple interventions of iron supplementation or dietary alterations. Such interventions in future would not only reduce morbidity but also have a significant financial impact on the health care systems.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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