

## Iron Deficiency Anemia in Children with Febrile Seizures

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### ABSTRACT

**Aim:** To determine the frequency of iron deficiency anemia in children presenting with febrile seizures.

**Materials and methods:** This descriptive cross sectional study was conducted on 90 patients at department of Pediatrics, Ayub Teaching Hospital, Abbottabad.

**Results:** The mean age and hemoglobin were 1.44±0.988 years and 10.33±2.44 g/dl respectively. The males were 53(58.9%) and females were 37 (41.1%).

**Conclusion:** More than half of the children affected by febrile seizure have iron deficiency anemia.

**Keywords:** Iron deficiency anemia, febrile seizures, epilepsy, children

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### INTRODUCTION

The term febrile seizures is used for under 5 years children with temperature of 38°C or higher without cerebral infection or metabolic imbalances.<sup>1, 2</sup> The duration of fever is less than 15 minutes in simple febrile seizures also called generalized tonic clonic.<sup>3</sup> While the distinguishing features of complex febrile seizures are their focal location, duration less than 15 minutes and recurrence within 24 hours.<sup>4</sup> Another condition which has longer duration of more 30 minutes of seizure attack is called status epilepticus.<sup>5</sup> In pediatric practice febrile seizure is a major challenge due to high prevalence in under 5 years age children and its recurrent nature. The awareness about complications of febrile seizure is increased in recent times.<sup>6</sup> In Europe the incidence of febrile seizures is 2-5% in 6 months to 5 years children<sup>7</sup> but it higher in Asian children (5-10%)<sup>8</sup>. The problems associated with this condition are the risk of aspiration and psychological trauma to both parent and child.<sup>9</sup> Iron deficiency anemia is most common condition in which human body is lacking enough mineral iron. In developing countries upto half of the preschool population are affected by iron deficiency anemia.<sup>10, 11</sup> Iron deficiency anemia can be prevented and treated easily. Iron is required for hemoglobin synthesis as well as for enzymes participating in neurochemical reactions.<sup>12</sup> The features of iron deficiency anemia are attention deficit, poor memory, leaning disability, retarded motor activity and behavioural imbalance.<sup>13</sup> Literature has reported positive association between iron deficiency anemia and febrile seizures in children of less than five years age.<sup>1, 14</sup> The proposed mechanism can be iron deficiency may alter the seizure threshold of a child.<sup>10</sup> Studies reported frequency of iron deficiency in patient with febrile seizures to 63% in India <sup>9</sup> and 51.3% in Iran<sup>1</sup>. The rationale of this study was to find out frequency of iron deficiency anemia in children with febrile seizures. As no local data is available so this study will help in providing local data on this important aspect of iron deficiency anemia in children with febrile seizures. As iron deficiency anemia is preventable and treatable, it will help in the prevention and management of febrile seizures.

### METHODOLOGY

This descriptive cross sectional study was carried out at department of Pediatrics, Ayub Teaching Hospital, Abbottabad from February 2018 to august to 2019 on 90 cases by consecutive non-probability sampling technique. After obtaining the ethical approval from the hospital ethical review committee, a verbal informed consent was obtained from parents of the participants after explanation of the aims and benefits of the research. The calculated sample size was 90 by using the WHO software by using reported proportion of iron deficiency anemia in febrile seizures of 63%<sup>9</sup> at 95% confidence level and 10% absolute precision. Children with febrile seizures of both genders and with age range from 6 months to 5 years were included in the study. Children with intracranial infection, metabolic disorders, and thalassemia were excluded. Laboratory investigations like iron deficiency anemia, hemoglobin level, red cell distribution width and serum ferritin were performed by a single qualified pathologist who had more than 5 years experience.

The children was labeled positive for iron deficiency anemia if hemoglobin value was less than 10 g/dl, red cell distribution width greater than 16 % and serum ferritin value less than 7 ng/ml. The recorded data from the participatns were age, gender, hemoglobin level, red cells distribution width, serum ferritin and presence iron deficiency anemia. Strictly inclusion criteria were followed and stratification was done to control confounders and bias in the study results. Data were analyzed using SPSS 22. Quantitative variables like age and hemoglobin was calculated as mean and standard deviation. Frequency and percentage were calculated for categorical data like category of ferritin, red cells distribution width, gender and presence of iron deficiency anemia. Iron deficiency anemia was stratified by age and gender to see effect modification by using chisquare test at  $P \leq 0.05$  to be level of significance. Children with intracranial infection, metabolic disorders, and thalassemia were excluded. The recorded data from the children were age, gender, hemoglobin level, red cells distribution width, serum ferritin and iron deficiency anemia.

## RESULTS

The mean age of the study was  $1.44 \pm 0.988$  years with range from 6 months to 4 years. The mean hemoglobin level was  $10.33 \pm 2.44$  g/dl with range from 6 to 15 g/dl. The most common age group was 1-2 years ( $n=57$ , 63.33%) and least was 3-4 years ( $n=13$ , 14.44%). (Fig 1). The males were 53(58.9%) and females were 37 (41.1%). Most of the children's hemoglobin level was less than 10 g/dl ( $n=51$ , 56.7%). Fifty children have red cells distribution width of greater or equal to 16% (56.7%). The serum ferritin level was less than or equal to 7 ng/ml in 50(55.6%) and greater than 7 ng/ml in 40(44.4%). Iron deficiency was present in 53(58.9%). (Table 1). The frequency of iron deficiency associated with febrile seizures was higher in females (62.2%) than males (56.6%) but the difference was not statistically significant ( $P=0.598$ ). The details are shown in table 2. in febrile seizure and age groups was not statistically significant ( $P=0.359$ ). The detailed statistics are shown in table 3.

## DISCUSSION

This study was aimed to determine the frequency of iron deficiency anemia in children presenting with febrile seizures. Our main findings were; iron deficiency anemia was present in 58.9% children affected with febrile seizures, and association of iron deficiency anemia in children with febrile seizure with age ( $P=0.359$ ) and gender ( $P=0.598$ ) was not statistically significant. In our study the males were (58.9%) and females were (41.1%). As we included all children with febrile seizures and used consecutive sampling technique. A previous study on rat model investigated that genetic role is there in male predominance in febrile seizures.<sup>15</sup> A study conducted in Iran also reported that more males (66%) are affected by febrile seizures than females (34%).<sup>1</sup> Another study conducted in Karachi, Pakistan also reported male predominance for febrile seizures.<sup>16</sup> Similar findings were reported by others.<sup>17, 18</sup> Our findings showed that the mean age of the study was  $1.44 \pm 0.988$  years with range from 6 months to 4 years.

**Table 1: Frequency of gender, hemoglobin, red cell distribution, serum ferritin and iron deficiency anemia**

		Frequency	Percent
Gender	Male	53	58.9
	Female	37	41.1
Hemoglobin	<10 g/dl*	51	56.7
	>10 g/dl	39	43.3
Red cells distribution width	<16%	39	43.3
	$\geq 16\%$	51	56.7
Serum ferritin	$\leq 7$ ng/ml**	50	55.6
	> 7 ng/ml	40	44.4
Iron deficiency Anemia	Yes	53	58.9
	No	37	41.1
	Total	90	100

\* gram per deciliters, \*\* nanogram per milliliters

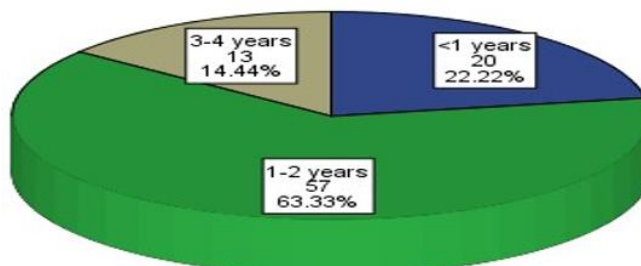
**Table 2: Iron deficiency anemia in febrile seizure stratified by gender**

Gender	Yes		No		P-Value
	n	%	n	%	
Male	30	56.6	23	43.4	0.598
Female	23	62.2	14	37.8	

**Table 3: Iron deficiency anemia in febrile seizure stratified by age groups**

Age group	Yes		No		P-Value
	n	%	n	%	
<1 years	11	55	9	45	0.359
1-2 years	32	56.1	25	43.9	
3-4 years	10	76.9	3	23.1	

\*chi-Square test



**Figure 1: Age distribution of the study**

Similar age was reported by previous investigation in Pakistan on febrile seizures in children.<sup>16</sup> The current study showed that the mean hemoglobin level was  $10.33 \pm 2.44$  g/dl in children suffered from febrile seizures. A previous study in Iran reported that mean hemoglobin was  $11.55 \pm 1.34$  g/dl in children suffered from febrile seizures.<sup>1</sup> Another study conducted in Karachi, Pakistan reported the mean hemoglobin was  $9.97 \pm 0.29$  g/dl in children having febrile seizures.<sup>19</sup> These results are almost similar to the current study.

Our findings showed that iron deficiency anemia in children having febrile seizures was present in 58.9%. Kumari et al.<sup>9</sup> conducted a study in India on frequency of iron deficiency in patient with febrile seizures and reported 63%. Another study in Iran reported 51.3% frequency of iron deficiency in patient with febrile seizures.<sup>1</sup> These studies support our findings. As our results showed that more than half of the children with febrile seizures are affected with iron deficiency anemia. So we expect a positive association of iron deficiency anemia and febrile seizures (FS). Previous study in Iran also reported positive association of iron deficiency anemia and febrile seizures (OR=1.89, 95% CI=1.04, 5.17).<sup>1</sup> Another study in India also found positive association of iron deficiency anemia and FS.<sup>20</sup> A study conducted in Karachi, Pakistan also reported significant positive association (OR=1.6, P<0.0) between the two diseases.<sup>19</sup> Although this study provide baseline information about the positive association of iron deficiency anemia and febrile seizure but further case-control studies with strict inclusion criteria on large samples are needed to further explore this association on our population. Further well controlled trials are needed to assess the etiological role of iron deficiency in febrile seizure.

## CONCLUSION

Within the limitations of this study it can be concluded that more than half of the children affected by febrile seizure have iron deficiency anemia. So clinicians need to be vigilant about iron deficiency anemia while providing care to children with febrile seizure.

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