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Frequency of Febrile Fits in Children with Iron Deficiency Anemia

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ABSTRACT

Objective: To identify the frequency of febrile seizures in children having iron deficiency anemia.
Methodology: This cross-sectional study was conducted at the Department of Pediatrics, Ayub Teaching Hospital, Abbottabad, over a period of six months from 20th January 2022 to 20th July 2022. A total of 147 children of both genders diagnosed with iron deficiency anemia were enrolled in the study. Blood samples were collected from all participants and analyzed for hemoglobin (Hb) levels, mean corpuscular volume (MCV), and plasma ferritin to confirm the diagnosis of iron deficiency anemia. Data regarding the occurrence of febrile fits were recorded as per the operational definition.
Results: The children from 6 months to 5 years with mean age of 3.074±1.12 years were there, and mean duration of complaint was 5.544±1.90 months. Male patients were 46.9% and females were 53.1%. Febrile fits were observed in 40.1% patients.
Conclusion: In conclusion, our data indicates that the presence of anemia and low blood iron levels might aggravate febrile fits in children.
Keywords: Febrile seizures, Iron deficiency anemia, Risk Factors

Authors' Contribution:
[1,2]Conception; Literature research; manuscript design and drafting; [2,3]Critical analysis and manuscript review; [2,3]Data analysis; Manuscript Editing.

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Introduction

Anemia in children is defined according to WHO in children as < 10.5 g/dL for ages 6–23 months, < 11 g/dL for ages 24–59 months and < 11.5 g/dL for ages 5–11 years. A large proportion of children aged 6–59 months in India and Southeast Asia are affected by anaemia, with the highest prevalence recorded in India (53.4%), followed by Myanmar (49.6%) and Cambodia (49%),[1] It is caused by many conditions among them the most common is iron deficiency.[2]

According to WHO, around 2 billion people or one third of world population are anemic out of which half of them suffer from iron deficiency anemia.[3] In Pakistan, iron deficiency anemia affects 65%of children.[4] It might be due to inadequate dietary Inspite of causing anemia, iron deficiency can also affect other organs and systems. The anemia is classified into hypoproliferative and hyperproliferative anemia on the basis of retic count. Hypoproliferative anemia are further divided by mean corpuscular volume into microcytic, normocytic and macrocytic anemias.[5]

Iron is needed during infancy for rapid growth development, early learning capacity, and physical growth. Early treatment of anemia leads to improved health and well-being[6]. Iron plays an important role in myelination, neurotransmitter synthesis and maturation of hippocampus and prefrontal cortex leading to impair attention and memory. At the cellular and molecular level, iron deficiency disrupts fundamental neurodevelopmental processes that extend beyond hematological alterations. Iron is required for mitochondrial oxidative phosphorylation, oligodendrocyte maturation, and the synthesis of monoaminergic neurotransmitters, including dopamine and serotonin, which are critical for synaptic plasticity and cortical network development so iro supplementation appears to be more effective during periods of active brain development. Fever may worsen the effects of iron deficiency on the brain[6]. Several studies have shown inconsistent results about the association between Febrile seizures and iron deficiency anemia.[7]

Febrile seizures occur when the body temperature suddenly rises to a temperature of more than 38°C or 100.4°F without any other underlying etiology that could cause seizures, such as abnormalities in electrolytes, central nervous system infection, trauma, drug withdrawal, heredity, or known epilepsy[8]. These seizures are common between 6months to 5-year age[9]. There are two categories of febrile seizures: simple and complex. Simple febrile seizures are generalized tonic clonic, occurring less than 15 minutes and not repeated in 24hrs whereas complex febrile seizures are focal, occurring more than 15 minutes and are repeated in 24 hrs[4,10]Children with one episode of febrile seizures may have one third chance of second episode.1-2 percent of the children with simple febrile seizures go on to develop epilepsy later in life whereas children with complex febrile seizures have 6-8 percent chance of developing epilepsy at a later stage[11] Because we are yet to fully understand the correlation between febrile seizures and iron deficiency in our general population. Therefore, this study was conducted to determine the frequency of febrile seizures in children with iron deficiency anemia. So, treating the iron deficiency anemia appropriately may decrease the incidence of febrile seizures.

Methodology

Cross This cross-sectional study was conducted at the Department of Pediatrics, Ayub Teaching Hospital, Abbottabad, over a period of six months from 20th January 2022 to 20th July 2022. The sample size of 147 children was calculated using WHO sample size software, based on a 95% confidence interval, 8% margin of error, and an anticipated incidence of febrile fits of 58% in children with iron deficiency anemia. Non-probability consecutive sampling technique was employed. Children of both genders, aged 6 months to 5 years, diagnosed with iron deficiency anemia as per the operational definition were included in the study. Iron deficiency anemia was defined as hemoglobin <10.5 g/dL for children aged 6 months to 2 years, hemoglobin <11.5 g/dL for children aged 2 to 5 years, and serum ferritin level <12 µg/L on laboratory testing. Children with a history of central nervous system infection (e.g., meningitis), previous afebrile seizures, metabolic disorders (hypoglycemia, hypocalcemia), structural brain malformations, epilepsy, developmental delay, or those already on iron supplementation were excluded from the study. After obtaining ethical committee approval, patients who fulfilled the inclusion criteria were enrolled from the Department of Pediatrics, Ayub Teaching Hospital, Abbottabad. Demographic information including age, gender, and duration of complaint was recorded as baseline data. Written informed consent was obtained from all parents or guardians, who were assured of confidentiality and informed that no risk was involved in participation. Blood samples were collected from each patient and

analyzed for hemoglobin, mean corpuscular volume (MCV), and plasma ferritin levels. Data regarding the occurrence of febrile fits, defined as a child presenting with a temperature of ≥100°F, loss of consciousness, bilateral limb shaking lasting more than one minute as observed clinically, were recorded in a specially designed proforma by the researchers. Data analysis was performed using SPSS version 22. Quantitative variables such as age and duration of complaint were expressed as mean ± standard deviation. Frequencies and percentages were calculated for categorical variables including gender and febrile fits. Stratification of febrile fits was performed across gender, age groups, and duration of complaint to identify effect modifiers.

Ethical approval of the study was taken from the Ayub Teaching Hospital, Abbottabad (RMTCNO. PED.2019-010-5513

Results

In this research the age group could be between 6 months-5 years with a mean age of 3.074 and plus 1.12 years and mean duration of complaints 5.544 and plus 1.90 months as in Table-I. There were 46.9 % male patients and 53.1 % female patients as in Table-II. The observed incidence of febrile seizures constituted 40.1 percent of patients as indicated in Table-III. The tables below illustrate stratification of febrile fits according to the age, gender and duration of complaint

Table- I: Mean ± SD of patients according to age and duration of complaints (n=147)

Demographics	Mean ± SD
Age (years)	3.074±1.12
Duration of Complaints (months)	5.544±1.90

Table- II: Frequency and %age of patients by gender n=147

Gender	Frequency	Percentage
Male	69	46.9
Female	78	53.1
Total	147	100

Table- III: Frequency and %age of patients according to febrile seizures (n=147)

Febrile seizures	Frequency	Percentage
Yes	59	40.1
No	88	59.9
Total	147	100

Table- IV: Age stratification of Febrile seizures

Age	Febrile seizures	
	Yes	No
6 months to 3 years	51(50.5%)	50(49.5%)
>3 years	8(17.4%)	38(82.6%)
Total	59(40.1%)	88(59.9%)

Discussion

Febrile seizures are one of the most common pediatric emergencies affecting children less than 5-year-old causing psychological trauma to parents. Majority of mothers think that febrile seizure is a life-threatening condition for the child.[12]

In our study, mean age was 3.074±1.12years whereas in a study carried out by Khan SA the mean age was 24.22+1.35 months.[8] Male patients were 46.9% and females were 53.1% where as in a study carried out by Kalmani M, males were in majority (56%).[13]

In this study, Febrile seizures were observed in 40.1% patient and Iron deficiency anemia was also observed in 68(42%) cases in a study carried by Jehangir A.[14] In another study carried by Salim M where iron deficiency anemia was assessed as a risk factor for first febrile seizure, iron deficiency as found in 88% cases.[4] In a study carried out in Nepal by Brajesh, iron deficiency was found in 59.7% cases.[15]

Many monoamines oxidase, neurotransmitters, and aldehyde oxidase require iron for metabolism.[14,16] Iron deficiency is a prevalent condition in children aged 2 to 3 years, and it has a significant influence in neuro-developmental and behavioral difficulties.[16] Thus, the function of iron as a causative factor is not much clear.

Conclusion

In conclusion, we have found that low serum iron levels and being anemic may act as supportive grounds with regard to the febrile seizures in the children. Thus, iron deficiency can be included in the list of risks that cause febrile seizures. Consequently, children having febrile seizures are recommended to be tracked in treating and diagnosing iron deficiency anemia. Moreover, the medication with iron supplements should be prescribed to children with critical and known risk factors to develop febrile seizure earlier but more meticulously, including family history of febrile seizure. It seems good to do a study to trace the iron deficiency children, who have fallen to febrile seizures after the treatment of iron deficiency, regarding the recurrence of febrile seizures.

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