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IRON DEFICIENCY ANEMIA AMONG CHILDREN WITH FEBRILE SEIZURES.

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ABSTRACT… Objectives: This study was aimed to find out the frequency of iron deficiency anemia (IDA) among children with febrile seizures (FS). **Study Design:** Descriptive, Cross-Sectional study. **Setting:** Department of Pediatric Medicine, The Children's Hospital and The Institute of Child Health Multan. **Period:** from 31st July to 31st December 2017. **Material & Methods:** A total of 57children, age 6 months to 6 years of either gender presenting with FS were enrolled in the study. Demographic data included age, gender, residential area, maternal literacy and socio-economic status. Work-up for iron deficiency anemia included hemoglobin (Hb) level with serum ferritin levels. Mean and standard deviation were reported for age, disease duration, Hband ferritin levels whereas frequency and percentages are reported for categorical data. **Results:** A total of 57 children that included 66.7 % females (n=38) were enrolled. Mean Hb (g/dl) and ferritin (μg/L) level was 8.87±6.01 and 9.12±7.36 respectively. IDA was observed in 28.1% (n=16) of the patients. IDA was significantly higher in children 6 months to 3 years age (p-value 0.038), from rural origin (p-vale 0.005), with low income status (p-value 0.025) and children of illiterate mothers (p-value 0.004). **Conclusion:** IDA is not uncommon in children with FS. Children younger than 3 years, from rural origin, with low income status, and having illiterate mothers were more prone to IDA.

Key words: Children, Febrile Seizures, Ferritin, Iron Deficiency Anemia, Low Income Status.

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INTRODUCTION

Febrile seizure (FS) is the commonest convulsive disorder affecting 2 to 5% of children between 3 to 60 months of age.[1] FS is defined as a seizure associated with a fever (temperature > 38°C) in the absence of central nervous system infections or acute electrolyte abnormalities in 6-60 months old children no past history of afebrile convulsions. FS is further classified as simple and complex types. Complex FS is defined as a seizure lasting more than 15 minutes, recurring within 24 hours or focal seizure.[2]

In Pakistan, IDA is found in 33.2% of children.[3] Genetic factors and micronutrient deficiencies have been postulated as the basis of pathogenesis for this condition.[4] Iron deficiency is one of the most common micronutrient deficiencies affecting one third of the global population. Iron deficiency is proposed to be involved in delay of myelination of neurons especially in hippocampus, leads to impaired energy metabolism, and variations in production and release of neurotransmitters like Dopamine, Gamma-Amino Butyric Acid (GABA) and serotonin. These mechanisms are thought to be causing symptoms of FS.[5]

A study conducted in Iran by Ghasemi et al included 300 children in three groups. Group I included children with FS, Group II included febrile children without convulsions and Group III included healthy children. IDA was detected in 40% of children with FS, 26% of febrile children without seizures and only 12% of healthy children.[6] A case-control study from Pakistan included 90 children 1:1 in FS and febrile without seizure group found 60% (n=27) IDA in FS group compared to only 17.8% (n=8) in febrile without

seizure group.[7]

Increased parental anxiety and apprehension due to seizures, its relation to epilepsy in 2-4% of the cases, the need for hospitalization, costs for families and the society, and likelihood of recurrence (30% and 50% after the first and the second occurrences, respectively)[6] have led the researchers to look intoprecipitating factors like IDA. So, conducting this study in our local population seems reasonable and the results will produce useful baseline database of our local population the results of which will help pediatrician to anticipate, diagnose and manage these cases of FS.

MATERIALS & METHODS

This descriptive cross-sectional study was conducted after permission from the ethical review committee over a period of six months from 31st July to 31st December 2017 at the department of Pediatric Medicine, The Children's Hospital and The Institute of Child Health Multan.

After informed consent from the parents/ guardians, we enrolled 57 consecutivechildren, age 6 months to 6 years of either gender presenting with FS. Children already on iron supplementation, diagnosed thalassemia syndromes, with developmental delay, cerebral palsy, known epilepsy, CSF proven meningitis / encephalitis and with metabolic fits due hypocalcemia and hypoglycemia were excluded.

We obtained demographic data on age (in years), gender, residential area (rural/urban), maternal literacy (based on years of formal education obtained) and socio-economic status (based on monthly household income). Three milliliter (3 ml) of venous blood was collected in serum vial and 2 ml of blood in EDTA tube for the diagnostic work-up for iron deficiency anemia that included hemoglobin (Hb) level and serum ferritin levels. All the investigations were done from single laboratory. We defined IDA as hemoglobin (Hb) level < 11 g/dl and serum ferritin level < 12 μg/L. All the information was collected on predesigned performa.

All the data was entered in and analysed using SPSS version 23. Mean and standard deviation are reported for age, disease duration, Hb and ferritin levels whereas frequency and percentages are reported for categorical data. Association of different demographic characteristics with iron deficiency anemia in children with FS was assessed using chi-square test and a p-value of ≤ 0.05 was taken as significant.

RESULTS

Mean age of the study participants (n=57) was 3.05±1.38 years and 66.7% (n=38) were females. Overall, mean age was noted as 3.05 years with standard deviation of 1.38 years. Most of the children were 6 months – 3 years old (n=34, 59.6%). Children from urban origin predominated the study population (n=31, 54.4%) and 52.6% (n=30) children belonged to middle income households. Mean hemoglobin concentration of the participants was 8.87±6.01g/dl and mean ferritin level were 9.12±7.36(μg/L). IDA was documented in 28.1% (n=16) of the included children [Table-I]. Distribution of maternal education highlighted that 26% (n=15) of the women were illiterate, 23% (n=13) obtained elementary education and 18% (n=10) women had obtained intermediate education [Figure-1]. Highest proportion of the children belonged to Saraiki ethnicity n=25 (43.9%) followed by Punjabi n=12 (21.1%) and Urdu speaking n=7 (12.3%) [Figure-2].

Distribution of IDA was not significantly different in male vs. female children (23.7% vs. 36.8%, p-value 0.3). However, IDA was significantly higher in 6 months – 3 years age group compared to > 3 – 6 years group (38.2% vs. 13%, p-value 0.04). Similarly, iron deficiency anemia was higher in children from rural area (46.2% vs. 12.9%, p-value 0.005), in middle income household (43.3% vs. 21.6% of low- & high-income group, p-value 0.02) and in children whose mothers were illiterate (66.7% vs. 14.3 in any level of education, p-value 0.004) [Table-II].

Characteristics	Number (%)
Age groups	
6 months – 3 years	34 (59.6)
> 3 – 6 years	23 (40.4)
Gender	
Male	38 (66.7)
Female	19 (33.3)
Residential Area	
Rural	26 (45.6)
Urban	31 (54.4)
Socio-economic status	
Low income	16 (28.1)
Middle income	30 (52.6)
High income	11 (19.3)
Iron deficiency anemia	
Yes	16 (28.1)
No	41 (71.9)

Table-I. Characteristics of children with FS (n=57)

Characteristic	Iron deficiency Anemia		P-Value
	Yes	No	
Residential status			
Rural	12 (46.2)	14 (53.8)	0.005
Urban	04 (12.9)	27 (87.1)	
Socioeconomic status			
Low income	2 (12.5)	14 (87.5)	
Middle Income	13 (43.3)	17 (56.7)	0.02
High Income	1 (9.1)	10 (90.9)	
Maternal education			
Illiterate	10 (66.7)	5 (33.3)	0.004
Any level of education	6 (14.3)	36 (85.7)	
Age group			
6 months – 3 years	13 (38.2)	21 (61.8)	0.04
> 3 – 6 years	03 13.0)	20 (87.0)	
Gender			
Male	9 (23.7)	29 (76.3)	0.3
Female	7 (36.8)	12 (63.2)	

Table-II. Association of IDA with demographic characteristics in children with FS (n=57)

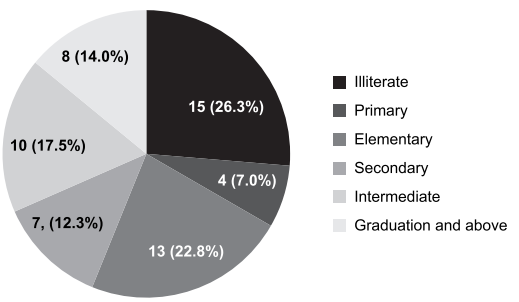

Figure-1. Maternal education status of children with FS (n=57)

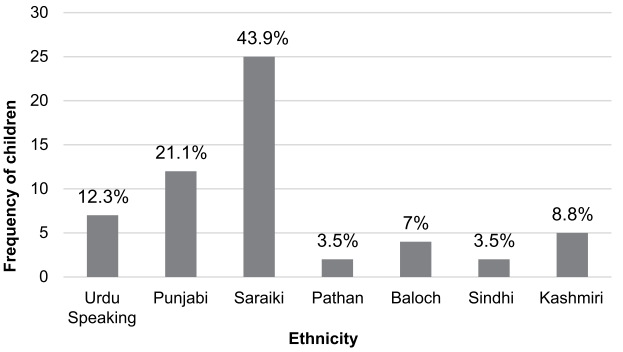

Figure-2. Ethnicity of the children with FS (n=57)

DISCUSSION

Iron deficiency is one of the commonest micronutrient deficiencies worldwide, especially in developing countries.[8] IDA was observed in 28.1% (n=16) children in our study. Concordant with our results was a study from Karachi that reported 26.1% frequency of IDA in children with FS.[9] However, in another multicenter study from Lahore and Quetta, this frequency was only 17% (n=17).[10] The reported variation can result from the factors not captured in most of the studies i.e. nutritional status of the included participants, iron supplementation prior to inclusion into the study.

Of all the participants 60% children aged ≤ 3 years. This age group also had significantly higher frequency of IDA (p-value 0.04). Age ≤ 3 years is more vulnerable because of poor complementary diet with delayed weaning and increased duration and amount of milk consumption in these children.[11] Other factors contributing to IDA include rural residence, low socioeconomic status and poor education status of the mothers were also evident in our study. All these factors also contribute to poor nutritional history, increased rate of infectious illnesses due to poor vaccine uptake.[12] Male constituted 66% of our study group and gender distribution did not significantly differ in IDA positive and negative groups. However, in study by Sarfraz et al[10] males constituted 45% of the study group. Gender distribution in the study by Ghasemi F et al[6] was similar to our study consisting of 66% males.

Mean hemoglobin concentration and ferritin levels in our study are much lower then reported

by Shazia et al[13] from Rawalpindi (10.48±1.16 vs 8.87±6.01 and 10±1.82 vs. 9.12±7.36 respectively). Similarly, hemoglobin levels in children with FS reported by Aziz et al[14] were higher (10.15±1.37) then our study. In resemblance to our study were the hemoglobin and ferritin levels in a study by Hussain et al[15] reporting 9.36±10.54 g/dl and 8.60±20.83μg/L respectively. Variation in the hemoglobin concentration are contributed by annual household income, educational status of the mother, level of maternal anemia, weaning practices and duration of breast feeding in children.[16]

Few of the limitations of our study were small sample size and lack of a comparison group to estimate the difference of IDA compared to healthy children. Also, our study was not designed to look for causes of IDA like nutritional status and lead poisoning. Although all children with IDA were put on iron supplementation therapy, we did not follow these children to look for recurrence of FS while on iron supplementation therapy.

CONCLUSION

IDA is not uncommon in children with FS. Children younger than 3 years, from rural origin, with low income status, and having illiterate mothers were more prone to IDA. Emergency physicians and pediatricians caring for these children should investigate and treat IDA so that the recurrences can be prevented. Correction of IDA will also lead to better growth and neurological development in these children.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Khalil Surani	Supervision, Study concept.	
2	Muhammad Yousuf	Methodology, Data analysis.	
3	Khalid Saleem	Literature review, Discussion.	
4	Sabiha Khan	Data interpretation, Drafting.	
5	Munir Ahmad	Data collection.	
6	M. Shahzaib Altaf	Data collection.	