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ORIGINAL ARTICLE

Association of iron deficiency anemia with febrile seizures: A case control study.

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ABSTRACT… Objective: To determine the association of iron deficiency anemia (IDA) with febrile seizures (FS). **Study Design:** Case Control study. **Setting:** Department of Pediatric Medicine, Bahawal Victoria Hospital, Bahawalpur. **Period:** January 2022 to July 2022. **Material & Methods:** A total of 30 children of both genders of age 1 to 5 years with febrile seizure and 30 children in control group (febrile without seizures) were included. Three ml blood sample of each patient was taken as sent to the institutional laboratory for assessment of iron deficiency anemia (hemoglobin < 11.5 g/dl). Association of IDA with FS was calculated. **Results:** Out of 60 patients, 28 (46.7%) were boys and 32 (53.3%) girls with boy to girl ratio of 1:1.1. The mean age in case group was 2.93 ± 1.23 years and in control group was 3.0 ± 1.31 years. Majority of the patients 39 (65.0%) were between 1 to 3 years of age. Frequency of IDA in case group (febrile seizure group) was found in 11 (36.7%) while in control group (febrile disease without seizures) it was found in 4 (13.3%) children (p=0.037, odds ratio=3.76). **Conclusion:** There is a significant positive association of IDA with FS.

Key words: Anemia, Epilepsy, Febrile Seizures, Iron Deficiency.

INTRODUCTION

Febrile seizures (FS) is known to be frequently observed disorder among children that makes the parents worried and concerned. The FS is also worrisome for the parents as it might occur again. The incidence of FS is 3-4% among the children of younger age groups and it should not be left unaddressed.[1] The occurrence of FS is found to be most prevalent in the children of age 6-60 months with fever and who do not have any infection of CNS or severe imbalance of electrolytes, or have no previous history of afebrile seizures.[2]

In order to explore the occurrence, reoccurrence, and the factors which place the children at higher risk of febrile seizures, a number of studies have been conducted all over the world. Majority of the studies revealed risk factors which were non-modifiable like family history, age of onset, nature of seizures and the degree of fever at that time, while some of the studies have described other modifiable factors.[2,3] Recently, it has been reported in some of the studies that iron deficiency anemia (IDA) may lead towards febrile seizures, because both febrile seizures and IDA is frequently observed among the children of age under two years.[4] Iron, being an important structural part of hemoglobin, actively participates in the process of transportation of oxygen to the various types of tissues like brain.[5] Some of the neurotransmitters like monoamine aldehyde oxidase are not metabolized properly if there is deficiency of iron. There is adequate data available to support the hypothesis that a potential risk factor of a convulsion might be deficiency of iron.[6]

As the IDA is of great concern for development and growth of children, this study was planned in order to establish if there is an association between IDA and febrile seizures among the local population. The evaluation of the burden of disease for the local population is extremely important because the main part of the population lives in rural areas and due to deprived economic

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conditions their children suffer from malnutrition. The results of this study were thought to enable us to have local data to address the issue. The aim of this research was to determine the association of iron deficiency anemia with febrile seizures.

MATERIAL & METHODS

This case control study was done in the pediatric medicine department of Bahawal Victoria Hospital, Bahawalpur after the approval from the "Institutional Ethical Review Board" (letter number: 1791, dated 13-07-2022). The duration of study was January 2022 to July 2022. Sample size of 60 (30 in each group) was calculated taking confidence level of 95%, power of study 80%, P1 = 45%[8], P2 = 12%.[8] A total of 30 children of both genders of age 1 to 5 years with FS and 30 children in control group (febrile without seizures) were included. Children with family history of epilepsy or afebrile seizures, renal disease, chronic liver disease, previously diagnosed cases of iron deficiency or patients on iron supplements for last 1 month were excluded. Three ml blood sample of each child was taken and sent to the institutional laboratory for hemoglobin (Hb) assessment. The IDA was labeled as Hb<11.0 g/dl).

Statistical analysis was performed using "(SPSS)", version 26.0. Results were presented as mean and standard deviation for age and weight whereas frequency and percentage were calculated for gender, place of living (rural/urban), family history of seizures (present/absent) and ID (present/absent). Effect modifiers like age, weight of children, gender, family history of seizures and place of living (rural/urban) were controlled through stratifications. Post-stratification chi square was applied and p-value ≤0.05 was considered as significant. Odds ratio was also calculated and OR >1 was taken as significant.

RESULTS

In a total of 60 children, 28 (46.6%) were boys and 32 (53.4%) girls showing boy to girl ratio of 1:1.1. The mean age in case group was 2.93 ± 1.23 years and in control group was 3.0 ± 1.31 years. Majority of the patients, 39 (65.0%) were between 1 to 3 years of age. Table-I is showing baseline characteristics of children in both study groups.

Frequency of IDA in case group (FS group) was found in 11 (36.7%) while in control group (febrile disease without seizures) was found in 4 (13.33%). as shown in Table-II which is showing-value as 0.037 and odds ratio of 3.76 which is significant and shows a positive association between FS and IDA. Stratification of iron deficiency anemia with respect to gender, age groups, weight, family history of seizures, place of living and febrile seizures is shown in Table-II.

Characteristics	Cases(n=30)	Controls(n=30)	Total(n=60)
Age(years)<3Years	20(66.6%)	19(63.3%)	39(65.0%)
Male	16(53.3%)	12(40.0%)	28(46.6%)
Family H/O Seizures	09(30.0%)	08(26.6%)	17(28.33%)
Weight(kg)<6kg	18(60.0%)	18(60.0%)	36(60.0%)
Place of living (Rural)	20(66.6%)	21(70.0%)	41(68.33%)
Iron deficiency anemia	11(36.67%)	04(13.33%)	15(25%)

Table-I. Baseline characteristics of children (N=60)

Characteristics	Cases (N=30)		Controls (N=30)		P-Value	OR
	Iron Deficiency Anemia		Iron Deficiency Anemia			
	Yes (n=11)	No (n=19)	Yes (n=4)	No (=26)		
Sex (Male)	7 (63.6%)	09 (47.4%)	2 (50%)	10 (18.2%)	0.142	3.89
Age(<3yr)	5 (45.5%)	15 (78.9%)	1 (25%)	18 (69.2%)	0.119	6.00
Weight<6kg	5 (45.5%)	13 (68.4%)	01 (25%)	17 (65.3%)	0.104	6.54
Family H/O seizures	5 (45.5%)	04 (21.1%)	02 (50%)	06 (23.1%)	0.21	3.75
Place of living (Rural)	8 (72.7%)	12 (63.2%)	03 (75%)	18 (69.2%)	0.073	4.00
Febrile Seizures	11 (100%)	19 (100%)	04 (100%)	26 (100%)	0.037	3.76

Table-II. Stratification of iron deficiency anemia with gender, age groups, weight, family history of seizures, place of living and febrile seizures

DISCUSSION

The deficiency of iron is considered to be the most frequently occurring nutritional deficiency all over the world.[7] Almost all of the human body cells make use of iron, an essential micronutrient but when there is deficiency of iron, neurons get stimulated to enhance their function; hence the chances of convulsions are also increased.[7] In this study, IDA was found in 36.67% children with FS while in febrile children without seizures, it was noted in 13.3% (p=0.037; odd ratio=3.76) which is significant and showed a progressive relationship of febrile seizures with IDA. In another study, IDA was noted in 45% of the infants presenting FS while it was only 12% in control group.[8] In another research, among children of experimental group, 52.5% had IDA compared with 20% in the control group.[9] Naveed and Billo found significantly low levels of serum ferritin (SF) in the children presenting with FS vs controls and described that iron deficiency was a potential risk factor for FS among children.[10] Pisacane et al of Naples also mentioned that IDA was significantly associated with FS in children.[11] They reported that the frequency of IDA was significantly higher among children presenting with convulsions when compared to control groups while calculations were made on the basis of serum iron concentrations.[11] In a case-control study from Kenya and in a meta-analysis of eight case-control studies, experts tried to find a linkage between febrile convulsions and iron deficiency, and concluded that among children, iron deficiency might be a potential risk factor to cause febrile seizures.[12]

To prevent febrile seizures among children and to avoid its recurrence too, prompt detection and recovery of iron deficiency might be helpful.[13] A study found that the prevalence of anemia was 32.2% in FS case and 20% in controls, showing a significant association of anemia with FS.[14] Our study results also coincided with the findings of Hartified et al, revealing the fact that among children presenting with FS, the incidence of iron deficiency was almost twice of the children who had adequate levels of iron.[15] Zareifar et al conducted a study in Shiraz, Iran, considering 20 ng/dl as minimum level of serum ferritin to label iron deficiency, found that among children, FS were more frequent (56.6% vs. 24.8%), whereas Hb level detected in the seizure free febrile children was lower than to that of having FS.[16]

In contrast, according to three other studies, higher levels of serum iron and serum ferritin were observed in FS than in seizure free febrile children. Bidabadi described in a study that the frequency of iron deficiency was 44% in FS group and 48% in the control group, significantly higher levels of serum iron and serum ferritin were found among the patients presenting first FS versus controls.[17] Findings of Derakhshanfar et al revealed that among FS patients, significantly higher levels of Hb, Hct, MCV, MCH, MCHC, RBC count, serum iron and serum ferritin were observed in comparison to control group, and vice versa for total iron binding capacity.[18] The IDA was significantly more frequent in control group than cases (p=0.016).[18] Momen and Hakimzadeh of Iran described opposite findings that among local children aged less than 5 years, IDA and FS were not significantly related.[19]

There is a need to encourage our local population to provide proper nutrition to children. To minimize the burden of anemia and its complications, timely diagnosis and treatment needs to be initiated. This study has shown a positive association of IDA with FS. So, we recommend that public awareness programs should be arranged to educate public for its prevention and early detection in order to correct iron deficiency and its related risk factors among children.

CONCLUSION

There is a significant positive association of IDA with FS. Further prospective trials needs to be conducted to further verify what is known about the association of IDA with FS among pediatric age groups.

REFERENCES

1. Shaikh AM, Inamdar NR, Singh DK. **Association of iron deficiency states and febrile seizures in children-a case control study.** Int J Res Med Sci. 2018; 6:869-77.

2. Tarhani F, Nezami A, Heidari G, Dalvand N. **Factors associated with febrile seizures among children.** Ann Med Surg (Lond). 2022; 75:103360. doi:10.1016/j.amsu.2022.103360

3. Kamalammal R, Balaji MD. **Association between iron deficiency anemia and various red cell parameters with febrile convulsions in children of age group 3 to 60 months.** Int J Contemp Pediatr. 2016; 3:559-62.

4. Singh P, Mehta V. **Is iron deficiency anaemia a risk factor for febrile seizure?** A case control study. Int J Contemp Pediatr. 2016; 3:1307-11.

5. Gupta S, Agarwal N, Maheshwari M. **Iron deficiency anaemia as a risk factor for febrile seizures a case control study.** People J Sci Res. 2015; 8(2):37-40.

6. Karimi P, Badfar G, Soleymani A, Khorshidi A, Tardeh Z. **Association of iron deficiency anemia and febrile seizure in Asia: A systematic review and meta-analysis.** Iranian J Neonatol. 2018; 9(1):42-52.

7. Heydarian F, Vatankhah H. **The role of anemia in first simple febrile seizure in children aged 6 months to 5 years old.** Neurosciences (Riyadh) 2012; 17:226-9.

8. Ghasemi F, Valizadeh F, Taee N. **Iron-deficiency anemia in children with febrile seizure: A case-control study.** Iran J Child Neurol. 2014; 8(2):38-44.

9. El-Shafie AM, Abou El-Nour ESS, El-Hawy MA, Barseem ZM. **Study of iron deficiency anemia in children with febrile seizures.** Menoufia Med J. 2017; 30:209-12.

10. Naveed-Ur-Rehman. Billo AG. **Association between iron deficiency anemia and febrile seizures.** J Coll Phys Surg Pak. 2005; 15(6):338-40.

11. Pisacane A, Sansone R, Impagliazzo N, Coppola A, Rolando P, D'Apuzzo A, et al. **Iron deficiency anemia and febrile convulsions: Case–control study in children under 2 years.** Brit Med J. 1996; 313:343.

12. Idro R, Gwer S, Williams TN, Otieno T, Uyoga S, Fegan G, et al. **Iron deficiency and acute seizures: Results from children living in rural Kenya and a Meta-analysis.** PLoS One. 2010; 5(11):e14001

13. Gupta S, Agarwal N, Maheshwari M. **Iron deficiency as a risk factor for febrile seizures – A case control study.** People's Journal of Scientific Res. 2015; 8(2):37-40.

14. Vikash L, Haresh K, Shahina H, Om P, Suneel A. **Association of iron deficiency anemia in children with febrile convulsions.** Pak J Neurol Sci. 2016; 11:1-10.

15. Hartfield DS, Tan J, Yager JY, Rosychuk RJ, Spady D, Haines C, et al. **The association between iron deficiency and febrile seizures in childhood.** ClinPediatr (Phila). 2009; 48:420-6.

16. Zareifar S, Hosseinzadeh HR, Cohan N. **Association between iron status and febrile seizures in children.** Seizure. 2012; 21(8):603-5.

17. Bidabadi E, Mashouf M. **Association between iron deficiency anemia and first febrile convulsion: A case-control study.** Seizure. 2009; 18(5):347-51.

18. Derakhshanfar H, Abaskhanian A, Alimohammadi H, ModanlooKordi M. **Association between iron deficiency anemia and febrile seizure in children.** Med Glas Ljek Komore Zenicko-doboj Kantona. 2012; 9(2):239-42.

19. Momen AA, Hakimzadeh M. **Case– control study of the relationship between anemia and febrile convulsion in children between 9 months and 5 years of age.** Sci Med J Ahwaz Uni Med Sci. 2003; 1(4):50-4.

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3	Iftikhar Ahmed	Literature review, References.	
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