

Iron Deficiency among Patients with Febrile Seizures in Al Ramadi Maternity and Children teaching Hospital, Western Iraq

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Abstract

Background : Febrile seizures are the most predominant neurological disorders in children between 6 months-5 years, at the same time iron deficiency anemia is one of nutritional insult that implicated as risk factor for occurrence of febrile seizures.

Objectives: to estimate the role of iron deficiency as a risk factor for febrile seizures in children aged 6 months -5 years, western Iraq.

Patients and method:- A case control study has been conducted in AL Ramadi maternity and children teaching hospital during January to October of 2016. All children with history of febrile seizures aged 6 months-5years were involved as cases group, others with febrile illness and no seizures were considered as control group. Data from 58 child of each group were collected. The data include age, sex ,temperature, causes of febrile illness, Hb ,hematocrit and s. ferritin levels. The data were subjected to statistical analysis run under IBM SPSS ver. 23.

Results:- Means age \pm SD were 27.48 ± 14.83 & 23.24 ± 14.37 months in cases and control groups respectively with no significant difference between them. Most of the children (65.52%) of those with febrile seizures were less than 3 years old. Mean temperature of cases group (38.86° C) was found to be significantly greater than that of the control group (38.52° C) at p-value <0.01 . Mean Hb level ,PCV%, s. ferritin level were significantly lower in cases group than in control group. Proportion of iron deficiency anemia was significantly higher in febrile seizure group (65.52%) than in control group (31.03%) at p-value < 0.01 .

Conclusions: Occurrence of IDA in cases group is found to be more than 2 times of that in the control group. Early detection and proper treatment of IDA can play a prominent role in limitation the prevalence of febrile seizures among children below 5 years.

Key words: febrile seizures, IDA, western Iraq

Introduction

Febrile seizures (FSs) is the most predominant neurological disorders in childhood with a multifactorial inheritance that occur in 2-5% of children in united states, 5-10% in India and up to 14% in Guam⁽¹⁻³⁾.

FSs described as a seizures that come in association with high grade fever of 38 centigrade or more without brain infection or electrolytes disturbances involving age groups ranged from 6months-5 years with peak age of occurrence of 18-24 months^(4,5).

Iron deficiency anemia (IDA) is another well pronounced easily correctable nutritional problem that can affect the intellectual development and occur predominately in a nearly similar age interval of FSs in young children 6months -24 months^(6,7).

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In general, anemia was noted in a proportion 46-66% of children younger than 4 years of in developing countries and approximately half of them were iron deficient⁽⁸⁾.

Indeed, iron is one of the micronutrient that have an important role in neuronal development (neurogenesis), maturation of myelin, energy and neurotransmitters metabolism^(9,10) as well as formation of hemoglobin.

Thus abnormal neurotransmitters functions as a sequence of iron deficiency, may in turn contribute to alteration of seizure threshold and initiation of febrile seizures in young children⁽⁷⁾.

So if we take into account the same age prevalence of IDA & FSs and the effect of iron deficiency on brain function, as well as the value of Hb in carrying O₂ to brain, and since presence of fever can exaggerate the symptoms that result from effect of IDA on brain, so relation between FSs & IDA is probable.

Based on all the above considerations, and since no study was conducted in Al Ramadi province western Iraq, about such problem, so our study was conducted to estimate the role of iron deficiency as a risk factor for febrile seizures among children from 6 months-5 years, western Iraq.

Patients and Methods

A case control study has been conducted in AL Ramadi maternity and children teaching hospital, western Iraq during the period January to October of 2016. The study approved by the ethics committee of AL Anbar University, Medical College. All children who admitted with history of febrile seizure and their age ranged from 6 months-5 years were involved in the study as a febrile seizure group (FSG). The control group collected randomly from children between 6 months -5 years who they admitted for same hospital during study period with febrile illness & no seizures (non-seizure group, NSG).

Detailed history and physical examination were done for them. Simple febrile seizure defined as single seizure that associated with peak of fever, last less than 15 minutes, once per day and generalized features, complex febrile seizures defined as seizure last more than 15 minutes, frequent per day or had focal features⁽¹¹⁾. All patients with history of CNS infection and history of delayed developmental milestone were excluded.

Information that collected from studied groups include age, sex, degree of temperature at admission, causes of febrile illness (respiratory tract infection, gastroenteritis, otitis media, tonsillitis, others), nature of seizures, duration and frequency of seizure were all recorded for every patient. Five mls of blood was aspirated to assess Hb, hematocrit (PCV) and s. ferritin values in studied groups (ferritin Accu Bind, ELISA Microwells, USA).

IDA defined as Hb level less than 11 gm/dl. PCV less than 30%, s. ferritin less than 12 ng/ml^(6,12).

The data were statistically analyzed using IBM SPSS v. 23.0, p-value < 0.05 was considered significant.

Results

One hundred sixteen children aged 6 months-5 years were included in the study during the period mentioned previously. Patients were classified into two groups each of 58 patients. The cases group involved 34 males and 24 females which indicates a male to female ratio of 1.42:1, on the other hand, the control group consist of 36 males and 22 females with a male to female ratio of 1.64:1.

Regarding FSG, 48 (82.7%) of them had simple type febrile seizures, and the remaining cases had complex type (17.3%). Most of patients with febrile seizures 38 (65.52%) were below age of 3 years. Out of this group 22 (37.93%) their age ranged from 12-24 months. Only four patients (6.9%) were found in the age group 6-12 months (Table 1).

The means age were 27.48±14.83 and 23.24±14.37 in FSG & NSG respectively with no significant difference between them (p=0.120), (Table 2).

The Chi-square test revealed no significant association between gender and groups of the study (Chi-square=0.144, p-value=0.7). Percentages of gender groups were compared to each other in both groups and found to be not significantly different (table 2). Mean temperature at admission was significantly higher in FSG than NSG, (p= 0.001).

Respiratory tract infection was significantly the most predominant cause of febrile illness in FSG 30 (51.7%) as compared to NSG 10 (17.2%), whereas gastroenteritis was significantly lower in FSG 20 (34.5%) as compared to NSG 38 (65.5%) (Table 2).

Means Hb level , PCV% & s. ferritin levels were significantly lower in FSG than in NSG, p values were all lower than 0.05.

The proportion of IDA among FSG was significantly higher than that of NSG , 38 (65.52%) vs. 18 (31.03%) , p-value=0.0003.

Table1: Distribution of patients according to age, gender and case-control groups.

| Age (Months) | FSG (n= 58) | | NSG (n=58) | |
|--------------|-------------|--------------|------------|--------------|
| | Gender | | Gender | |
| | Males N(%) | Females N(%) | Males N(%) | Females N(%) |
| 6-<12 | 0(0.0) | 4(16.67) | 10(27.78) | 6(27.27) |
| 12-<24 | 14(41.18) | 8(33.33) | 12(33.33) | 8(36.36) |
| 24-<36 | 4(11.76) | 8(33.33) | 2(5.56) | 6(27.27) |
| 36-<48 | 6(17.65) | 4(16.67) | 0(0.0) | 2(9.09) |
| 48-60 | 10(29.41) | 0(0.0) | 12(33.33) | 0(0.0) |
| Total | 34(100) | 24(100) | 36(100) | 22(100) |

Table 2: Demographic Characteristic and Hematological Findings Of Febrile Seizure Group and Non-Febrile Seizure Groups

| | | FSG(cases) (N=58) | NSG(Controls) (N=58) | P value |
|-----------------------------------|-----------------------------|-----------------------|-------------------------|---------|
| Age, months(mean | | 27.48±14.83 | 23.24±14.37 | 0.120 |
| Gender | Male N(%) | 34(59) | 36(62) | 0.74 |
| | Female N(%) | 24(41) | 22(38) | 0.74 |
| Temperature c0(mean ±SD) | | 38.86 ± 0.544 | 38.52 ± 0.580 | 0.001 * |
| Causes of febrile illness N(%) | Respiratory tract infection | 30(51.7) | 10(17.2) | 0.0002* |
| | Gastroenteritis | 20(34.5) | 38(65.5) | 0.011* |
| | Otitis media | 4(6.9) | 4(6.9) | 1.000 |
| | others | 6(10.3) | 6(10.3) | 1.000 |
| § Hb g/dl(meanSD) | | 10.54±0.83 | 11.16±1.12 | 0.001* |
| §§ Pcv%(meanSD) | | 30.72±1.58 | 34.50±3.63 | 0.000* |
| s. ferritin ng/ml (mean) | | 20.97±11.44 | 43.59±26.15 | 0.000* |
| IDA N(%) | | 38(65.52) | 18(31.03) | 0.0003* |

§ Hemoglobin, §§ Packed cell volume, * Significant difference

Discussion

Febrile seizures are the most common neurological disorder that occurs in children less than 5 years old without central nervous system infection or electrolyte disturbances.

In the current study FSs were pronounced predominately in children below age of 3 years (65.52%), mainly among 12-24 months age group which is in agreement with other studies^(13,14).

The mean age of onset of FSs was 27.48 months which is nearly similar to others^(4,5,15,16).

As described by other researchers^(13,17) majority of patients with FSs had simple type of seizure (82.7%) and the remaining had complex type. The association between FSG, NSG and gender groups was statistically insignificant which is comparable with results of other reports^(18,19).

Moreover, Like other reports^(15,20,21), this study revealed a significant high peak temperature at admission in FSG than NSG. It was generally reported that fever is one the risk factors implicated in occurrence of FSs that may aggravate the worse effect of lack of iron on brain function which may precipitate seizure attack.^(17,22)

Regarding causes of febrile illness, respiratory tract infection was the predominant cause of febrile illness in FSG which is found to be significantly higher than that of the NSG and that is in agreement with other studies⁽²³⁻²⁵⁾.

On the other hand gastroenteritis was significantly lower in FSG than NSG which supports the suggestion of its protective effect against FSs as reported by other studies^(5,26).

Several previous publications from different countries worldwide clearly demonstrated the existence of association between IDA and FSs and they considered IDA as an important risk factor for occurrence of FSs^(9,27,28).

This study carried out in the Western region of Iraq in order to cast light on some of the important concepts associated with main issue of the study. Accordingly, this study showed that there are statistically significant reduction in means Hb level, PCV %, s. ferritin level of (FSG) compared to (NSG), in addition the proportion of IDA in FSG was more twice that in the NSG (table 2).

This results is in agreement with Daoud A S et al's report, from Jordan, 2002⁽²⁹⁾ who study the association between IDA & s. ferritin, they thought that lack of iron could be possible cause of FSs. as they found a significant low mean s. ferritin levels and higher percentage of cases with low serum ferritin 30ug/dl among FSG than controls, 29±21mcg/L vs. 53.3±37.9mcg/L, (p 0.000).

On other hand, Kumari et al, 2012⁽³⁰⁾ used univariate and multivariate analysis for the data collected from the same purposes of this study, they observed a significant higher proportion of iron deficiency in FSG than controls, 63.6% vs.24.7% ,p=0.001 which is complies with the results of the current study. The same conclusion reported by Momen A et al., 2010 from Iran⁽¹⁸⁾, whom they confirm the existence of positive relation between febrile seizure and IDA.

Habibian N ,et al., 2014⁽³¹⁾ conducted a meta-analysis study and observed that IDA was moderately increased the chance of FSs in children especially in the regions of low or moderate percentage of IDA.

Moreover, similar significant association between IDA & FSs was pronounced by El-Shafie et al.,⁽³²⁾ 2017 whom conducted a prospective case control study of 60 cases aged 6 months -5 years from Egyptian children, they found that 21 (52.5%) of cases had IDA compared to 4 (20%) of controls p 0.05.

However, other studies had proved otherwise and denied any association between IDA and FSs and thus did not agree with results of this study. Amirjalali et al⁽³³⁾ Omen et al⁽³⁴⁾ and Abaskhanian A et al⁽³⁵⁾ deduced a lack relationship between IDA and FSs.

Furthermore, Derakhshanfar H, et al⁽⁵⁾ suggested that IDA was less common in febrile seizure patients than healthy children. Whereas Talebian A ,etal⁽³⁶⁾ in a study involved 120 children aged less than 5 years, reported that IDA was more common in controls than FSG and concluded that IDA was not a risk factor but rather a protective factor against FSs.

Bidabadi E and Mashouf M,⁽¹⁵⁾ in a case control study of 200 cases with febrile seizures and 200 controls aged 6 months-5 years, found that IDA was less frequent in patients with FSs than controls with no statistical difference between the two groups, but the protective effect of iron deficiency against FSs was not proved (odd ratio 1.175).

Indeed, these variation in results of these reports could be related to the variations in studies designs, different samples sizes and age groups involved, different measures used for diagnosis of IDA, nutritional status and prevalence of IDA among children involved in these studies from different regions. Unfortunately, no previous study was carried out in al Ramadi province, Western Iraq, regarding prevalence of IDA among children aged less than 5 years. Based on the results of this study, it can be concluded that IDA is about two times more predominant in FSs patients than in other patients with no FSs, and Iron deficiency is well recognized as a risk factor in children aged less than 5 year. In this context, early detection with proper correction of IDA will be effective in reducing rates of FSs among those children. Large sized prospective study is necessary to assess prevalence of IDA in children less than 5 years as well as to help evaluating nutritional problems that may contribute positively to the IDA.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

Conflict of Interest: The authors declare that they have no conflict of interest.

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