Febrile Convulsions in Anemic Children: A Review

Hassan Tag Elkhatim Mohamed1*, Ibtisam Khulaif Alruwaili2, Malsa Hamad Freaj Alenazi2, Ahlam sultan alanazi2 and Norah Thyap Matar Alenezi2

1Consultant of Pediatrics, Maternity and Children Hospital, Arar, Saudi Arabia.
2Faculty of Medicine, Northern Border University, Arar, Saudi Arabia.

ABSTRACT

Febrile convulsions are the most common type of convulsions that affect children aged 6 months to 5 years old. Iron deficiency anemia could be a risk factor for febrile convulsions as was suggested by some studies, for the reason that febrile convulsions is common in children under 5 years and iron deficiency anemia is also more common in children in the same age bracket. The prevalence of febrile convulsions is 2-5% of the total number of children. Studies discussing the association of iron deficiency anemia and febrile convulsions are contradictory. Management of cases is of great importance as there are special guidelines. Prevention is also vital as it plays a role in evading the occurrence of the convulsions.

Keywords: Iron deficiency anemia; febrile convulsions; children; fever.

1. INTRODUCTION

Children aged from 6 months to 60 months are highly susceptible to getting febrile illnesses. The peak age of febrile convulsions incidence is thought to be 14-18 months. Febrile convulsion is the most common illness in the nervous system that affect children and 2-5% of the total number of children or 4.8 out of every 1000 children become affected annually [1].

*Corresponding author: E-mail: hassantag3215@yahoo.com;
Febrile illnesses are any disease that cause fever with rising body temperature to 38°C or more for 2–7 days with no localizing source, infection of central nervous system, metabolic disorders, or history of febrile convulsions; this definition is credited to the American Academy of Pediatrics [2-7]. Febrile convulsions occur because the brain cannot endure the rise of body temperature. Febrile convulsions are mostly benign and rarely cause brain damage, while they may lead to emotional, physical, and mental damage [8]. Many studies have tried to conduct febrile convulsions risk factors, possibility to recur (30% and 50% after the first and the second events of convulsions, respectively), socio-economic effects on families and society, susceptibility to develop epilepsy in the future in 2-4% of cases, and its relation to increased risk of hospitalization [8,9]. Some of the risk factors aggravating febrile convulsions, are previous family history of convulsions or febrile convulsions, mothers who smoke or take alcohol, viral infections, certain vaccinations, developmental delay, discharging from a neonatal unit after 28 days, nutritional deficiencies (including iron and zinc), high fevers, and head traumas [10-19]. Iron deficiency anemia could be a risk factor for febrile convulsions as was suggested by some studies, for the reason that febrile convulsions is common in children under 2 years and iron deficiency anemia is also more common in children in the same age. Simple febrile convulsions typically have a good prognosis, with no indication for increased rates of mortality, hemiplegia, or cognitive disorders [20]. Febrile convulsions are mostly benign; nevertheless, families still feel stressed about the condition of their child.

Iron deficiency anemia (IDA) is the most common and typical type of micro-nutritional deficiency in the world. It is characterized by deficiency of iron from the body, thus decreasing the production of hemoglobin. Iron is present in the hemoglobin structure, thereby playing a vital role in the transport of oxygen to different tissues of the body such as the brain [21]. IDA affects at least one third of the people in the world, also affecting more than 20% of pregnant women and more than 23% of children under five years of age. Fortunately, IDA is a condition that is remediable and could be corrected [22]. Iron is an important micro-element that is used by all the cells in the body, especially the CNS and the neurons. Iron is a co-factor for numerous enzymes in the body and plays a role in the production of neurotransmitters and their function, hormonal function and DNA duplication [23]. Iron deficiency decreases the metabolism of some neurotransmitters and works on stimulating neurons thus leading to change of the amplitude and the threshold of neurons excitation, accordingly increasing the possibility of convulsions [24-27]. IDA is related with behavioral abnormalities and impaired cognitive function in adults and children. It can cause irreversible brain damage if it happens during the most active time of brain development in young children [28]. Studies reporting the association between IDA and febrile convulsions are conflicting, as some studies demonstrate that iron deficiency with or without anemia were more predominant in children with febrile convulsions, indicating significant association [29–36], while other studies showed no association between iron deficiency and febrile convulsions in children [37-41].

1.1 Study Objective

In this review, we looked into the updates on the association between IDA and febrile convulsions and management of febrile convulsions in anemic children.

2. METHODOLOGY

The review is a comprehensive research of Medline, Google scholar, EMBASE and PubMed databases from the year 2000 to 2021.

2.1 Study Duration

Data was collected during the period from 1–31 July, 2021.

2.2 Data Collection

Medline, Google scholar, EMBASE and PubMed databases searches were performed for articles about the most important recent developments in the association between IDA and febrile convulsions and management of febrile convulsions in anemic children, published in English around the world. The keyword search headings included “iron deficiency anemia, Febrile convulsions, Children, Fever”, and a combination of these was used. References list of each included study was searched for further supportive data.

2.3 Statistical Analysis

No software was utilized to analyze the data. The data was extracted based on specific form that
contains (Title of the publication, author’s name, objective, summary, results, and outcomes). Double revision of each member’s outcomes was applied to ensure the accuracy and minimize the mistakes.

2.4 Pathophysiology

Iron is an important micro-element that is used by mostly all the cells in the body and is especially utilized by the brain and neurons. Iron is an essential micro-nutrient for proper growth and development in children. Iron deficiency disturbs the function of many organs, leading to anemia, abnormal growth and behavior, mental retardation, altered thermoregulation, weakened physical performance and immune disorders. Iron is a co-factor for numerous enzymes in the body and plays a role in the production of neurotransmitters and their function, metabolism of some neurotransmitters such as monoamine and aldehyde oxidase, hormonal function, and DNA duplication [23-25]. IDA plays an important role in initiating of convulsions through decreasing gamma-aminobutyric acid (GABA) inhibitory neurotransmitter, increasing glutamate excitatory neurotransmitters, decrease of monoamines, altering neuron metabolism, and impairing oxygenation of the tissue [42]. Also IDA affects developing brain and mechanisms as altering development of hippocampus neurons, delaying maturing of myelin, slowing visual and auditory evoked abilities and also altering synaptic neurotransmitter systems including Norepinephrine, Dopamine, and serotonin and these may be responsible for inducing convulsions [43]. IDA effects on developing children is frustrating because iron supplementation later in life cannot cure the learning difficulties, behavioral disorders, and psychiatric problems which are associated with IDA in early life [44]. Some studies declared that the imbalance between excitatory and inhibitory synaptic activity is suspected to be associated with varied psychiatric disorders and convulsions [45-47].

2.5 Association of Iron Deficiency Anemia in Children with Febrile Convulsions

It is thought that there is an association between IDA and febrile convulsions but the evidence is inconclusive due to unreliable and conflicting results demonstrated in different studies. While some studies declare that there is association, some other studies report that there is no association between them.

A case control study was conducted among 510 children in the pediatric unit III, Civil Hospital, Karachi for six months from 30th April 2013 to 1st November 2013. The study aimed to determine the association of IDA in children who presented at the hospital with febrile convolution. The total participants were 240 (47.1%) male and 270 (52.9%) female patients. The inclusion criteria for the cases were aged 9 months to 5 years, either sex and having febrile convulsions, whereas the inclusion criteria for the controls were aged 9 months to 5 years, either sex with no history of convulsions. In the control group 73 (28.6%) were male and 182 (71.4%) were female patients. In the study group 167 (65.5%) were male and 88 (34.5%) were female patients. The age range of study subjects was 52 (7 – 59) months. In the control group the mean age was 35.27±9.11 months, mean weight was 13.13±2.55 Kg with range of 12 (7 – 19) Kg, mean hemoglobin level was 9.97±0.29 g/dl, mean MCV score was 65.84±1.97 fl, mean MCH score was 27.84±1.97 Pg, mean MCH score was 65.47±2.14 fl, mean MCHC score was 27.84±1.97 gm/dl, and mean Serum Ferritin Level was 30.84±1.97. In the study group the mean age was 34.53±9.49 month, mean weight was 12.80±2.64 Kg, mean hemoglobin level was 10.00±0.30 g/dl, mean MCV score was 65.47±2.14 fl, mean MCH score was 27.43±2.11 Pg, mean MCHC score was 28.45±2.09 gm/dl, and mean Serum Ferritin Level was 30.45±2.10 fl. Out of the total 510 participants, IDA was detected in 133 patients amongst them 51 were in the control group and 82 were in the study group. It was detected that there was significant association found between IDA and the two groups with p≤0.05 level of significance. Moreover, odds ratio of 1.608 specified that participants in cases are more possible to be diagnosed with IDA. From this study we conclude that children with febrile convulsions are most likely to develop IDA. IDA may be considered as a risk factor that may lead to febrile convulsions in children [48].

A cross-sectional study was carried out in the pediatric hospital in Assiut University, Assiut, Egypt among 100 children; 50 children with febrile convulsions were considered as the study group and 50 febrile children without convulsions as the control group. In the study group, the age of patients ranged from 0.7 to 4.3 years, and male patients in this group were 27 (54.0%) while the female patients were 23 (46.0%). In the control group, the age of patients ranged from 0.7 to 4.6 years, and male patients in this group were 35 (70.0%) while the female patients were
The variances between the study group and the control group were not significant \( P < 0.05 \). The results in the study group were as follows: the mean hemoglobin (HB) level was 10.20 ± 1.42, the mean HTC level was 32.30 ± 4.26, the mean MCV score was 72.83 ± 7.71, the mean MCH score was 23.60 ± 3.15, the mean serum iron level was 39.68 ± 18.00, and the mean serum ferritin level was 65.61 ± 86.87. While the results in the control group were as follows: the mean hemoglobin (HB) level was 12.22 ± 1.29, the mean HTC level was 37.37 ± 3.89, the mean MCV score was 82.29 ± 6.48, the mean MCH score was 26.34 ± 3.15, the mean serum iron level was 78.21 ± 42.95, and the mean serum ferritin level was 160.37 ± 105.76. The \( P \) values were significant, as the HB \( P = 0.000 \), HTC \( P = 0.000 \), MCV \( P = 0.000 \), MCH \( P = 0.000 \), serum iron \( P = 0.000 \), and the serum ferritin \( P = 0.000 \). We conclude from this study that iron deficiency is predisposing factor for developing febrile convulsions [49].

An analytical case control study conducted among 100 children in Shahid Sadoughi Hospital from December 2011 to August 2012. There were 45 girls and 55 boys with mean age of 23.7 ± 14.3 months. The participants were divided into two groups; case/febrile convulsions group and control/healthy group. The results in the case group were as follows: hemoglobin level 11.46 ± 1.18 g/dl, serum iron levels 48.91 ± 22.96 μg/dl, and serum ferritin level 38.52 ± 11.38 ng/ml. While in the control group the results were as follows: hemoglobin level 11.9 ± 0.89, serum iron levels 75.13 ± 35.57, and serum ferritin level 54.32 ± 13.46. Also iron deficiency and iron deficiency anemia were evaluated; the results were as follows: iron deficiency was present in the case/febrile convulsion group with a percentage of 48%, while it was present in the control/healthy group with a percentage of 28%, and iron deficiency anemia (IDA) was present in the case/febrile convulsion group with a percentage of 22%, while it was present in the control/healthy group with a percentage of 10% and as conducted from the results that IDA was more frequent in febrile convulsions group more than the healthy group (\( P \) values <0.05). The \( P \) values were significant and stated as follows: the HB \( P = 0.042 \), serum iron \( P = 0.001 \), and the serum ferritin \( P = 0.001 \). We conclude from this study that iron deficiency is a risk factor for developing febrile convulsions [50].

On the other hand, a case control study was conducted during March 2005 to September 2006 among 200 children with a diagnosed first febrile convulsion, aged between 6 months and 5 years. Patients were divided into two groups; the control group included the febrile children without convulsions and the case group included febrile children with convulsions. The results of this study were questioning, as the RBC level, serum iron level, and plasma ferritin level were significantly higher amongst the cases with first febrile convulsions than in the controls. The level of Hb, Hct, MCV, MCH, and MCHC were also higher among case group than control group, but variances were not significant. IDA was less frequent amongst the case group with febrile convulsion, as compared to the control group, and its difference was not statistically significant. So this study suggests that IDA was less frequent amongst the case group with febrile convulsion, as compared to the control group, and there was not a protective effect of iron deficiency against febrile convulsions [51].

We observed from reviewing several studies that results were contradictory, and until now there is no accurate and sure evidence of whether or not IDA is a risk factor for febrile convulsions.

### 2.6 Management

Management in this case is concerning two major lines, which are managing febrile convulsions solely first and then managing IDA.

When a child is presents to the emergency department the first step to make is checking ABC (airway, breathing, circulation), then measuring blood glucose after the first febrile convulsion [52,53]. Then, the clinician should work on differentiating whether the seizures are simple or complex, and if it is the first febrile convulsion then it needs to be differentiated from acute symptomatic seizures due to high risk of CNS infection [54]. Treatment is determined after knowing the main cause of the fever and managing its symptoms. It is important to make the child drink plenty of water to assure the hydration of the body, and then administer paracetamol or ibuprofen to ease feelings of discomfort, but do not administer paracetamol together with ibuprofen [55,56].

Parents and health workers should know that antipyretic drugs are used mainly to ease the discomfort caused by the infection, not to decrease the risk of febrile convulsions [57,58]. Some parents think that long term antiepileptic drugs are given as prophylaxis for febrile
convulsions, but this is wrong because side effects of antiepileptic drugs are more than their potential benefits [53,54,59,60]. Sometimes to stop seizures, benzodiazepines, such as rectal diazepam or buccal midazolam, can be given [61]. The last line of management is managing the IDA; management of IDA is partially easy and practicable as the main steps taken for convenient treatment is by using replacement therapy by using iron supplements, improving of nutrition and raising the nutritional education of patients and families, and stabilizing of environmental factors are pH as it affects the body absorption of foods containing iron [62].

3. CONCLUSION

IDA could be a potential risk factor for febrile convulsions, as children with febrile convulsions are more likely to develop IDA than those with febrile illness alone or healthy children. Our belief of this association is based on the physiological evidence of effects of iron deficiency on the brain.

However, we recommend doing further studies accessing the effect of IDA on the brain and whether IDA affects febrile convulsions or not. Also we recommend that iron status should be evaluated in children with febrile convulsions.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Johnston MV. Seizures in childhood. In: Kleigman RM, Behrman RE, Jenson HB, Stanton BP, editors. Nelson Text Book of Pediatrics. 18th ed. Philadelphia: Saunders Elsevier. 2007;2013–2019.
2. Lorenzi OD, Gregory CJ, Santiago LM, et al. Acute febrile illness surveillance in a tertiary hospital emergency department: comparison of influenza and dengue virus infections. Am J Trop Med Hyg. 2013;88(3):472-480.
3. Hubaira, Wani ZA, Qadri SMR. Relationship between serum zinc levels and simple febrile seizures: hospital based case control study. Int J Contemp Pediatr. 2018;5:42.
4. Graves RC, Oehler K, Tingle LE. Febrile seizures: Risks, evaluation, and prognosis. Am Fam Physician. 2012;85:149–53.
5. Talebian A, Mottazmanesh N. Febrile Seizure and Anemia. Iran J Child Neurology. 2007;31-33.
6. Aicardi J. Febrile convulsion in epilepsy in children. 5th ed, Lippincot: William & Wilkins; 2004;220-34.
7. Wolf PS, Shinnar S. Febrile seizures in current management in child neurology. 2th ed, Hamilton: London;2002.960-96
8. Jones T, Jacobsen SJ. Childhood febrile seizures: Overview and implications. Int J Med Sci. 2007;4(2):110–4.
9. Kliegman RM, Stanton BF, St Geme JW, Schor NF, Behrman RE. Nelson textbook of pediatrics. 19th ed. Philadelphia (PA): WB Saunders Company. 2011;2017.
10. Nelson KB, Ellenberg JH. Prenatal and perinatal antecedents of febrile seizures. Ann Neurol. 1990;27:127–31.
11. Greenwood R, Golding J, Ross E, Verity C. Prenatal and perinatal antecedents of febrile convulsions and afebrile seizures: Data from a national cohort study. Paediatr Perinat Epidemiol. 1998;12:76–95.
12. American Academy of Pediatrics Steering Committee on Quality Improvement and Management. Classifying recommendations for clinical practice guidelines. Pediatrics. 2004;114:874–7.
13. Sadleir LG, Scheffer IE. Febrile seizures. BMJ. 2007;334:307–11.
14. Steering Committee on Quality Improvement and Management, Subcommittee on Febrile Seizures American Academy of Pediatrics. Febrile seizures: Clinical practice guideline for the long-term management of the child with simple febrile seizures. Pediatrics. 2008;121:1281–6.
15. Barlow WE, Davis RL, Glasser JW, Rhodes PH, Thompson RS, Mullooly JP, et al. The risk of seizures after receipt of whole-cell pertussis or measles, mumps,
and rubella vaccine. N Engl J Med. 2001;345:656–661. DOI: 10.1056/NEJMoa003077
16. Ganesh R, Janakiraman L. Serum zinc levels in children with simple febrile seizure. Clin Pediatr (Phila). 2008;47:164–166.
DOl: 10.1177/0009922807306165
17. Huang CC, Wang ST, Chang YC, Huang MC, Chi YC, Tsai JJ. Risk factors for a first febrile convulsion in children: A population study in southern Taiwan. Epilepsia. 1999;40:719–725. DOI: 10.1111/j.1528-1157.1999.tb00769.x
18. Laina I, Syriopoulou VP, Daikos GL, Roma ES, Papageorgiou F, Kakourou T, et al. Febrile seizures and primary human herpesvirus 6 infection. Pediatr Neurol. 2010;42:28–31. DOI: 10.1016/j.pediatrneurol.2009.07.016
19. Vestergaard M, Hvid A, Madsen KM, Wohlfahrt J, Thorsen P, Schendel D, et al. MMR vaccination and febrile seizures: Evaluation of susceptible subgroups and long-term prognosis. JAMA. 2004;292:351–357. DOI: 10.1001/jama.292.3.351
20. Subcommittee on Febrile seizures. American academy of pediatrics neurodiagnostic evaluation of the child with a simple febrile seizure. Pediatrics. 2011;127:389–394. DOI: 10.1542/peds.2010-3318
21. Østergaard J, R. Febrile Seizures. Acta Paediatr. 2009;98(5):771–3. Available: http://dx.doi.org/10.1111/j.1651-2227.2009.01200.x
22. World Health Organization. A Guide for Program Managers. Geneva: WHO/NHD/013. Iron deficiency anemia. Assessment, prevention and control; 2001.
23. Hartfield D. Iron deficiency is a public health problem in Canadian infants and children. Paediatr Child Health. 2010;15:347–50. PubMed PMID: 21731416; PubMed Central PMCID: PMC2921732.
24. Lozoff B, Beard J, Connor J, Barbara F, Georgieff M. Long-lasting neural and behavioral effects of iron deficiency in infancy. Nutr Rev. 2006;64:34–43. Available: http://dx.doi.org/10.1301/nr.2006.may.S34-S43
25. Parks YA, Wharton BA. Iron Deficiency and the brain. Acta Paediatr Scand. 1989;(Suppl 361):71–77.
26. 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. PubMed PMID: 22772927.
27. Beard J. Iron deficiency alters brain development and functioning. J Nutr. 2003;133:1468–72S.
28. Beard JL. Iron biology in immune function, muscle metabolism and neuronal functioning. J Nutr. 2001;131:568S–580S. DOI: 10.1093/jn/131.2.568S
29. Pisacane A, Sansone R, Impagliazzo N, Coppola A, Rolando P, D’apuzzo A, et al. Iron deficiency anaemia and febrile convulsions: Case-control study in children under 2 years. Br Med J. 1996;313:343–344.
DOI: 10.1136/bmj.313.7053.343
30. Ghasemi F, Valizadeh F, Tae N. Iron-deficiency anemia in children with febrile seizure: a case-control study. Iran J Child Neurol. 2014;8:38–44.
31. Daoud AS, Batieha A, Abu-Ekteish F, Gharabeh N, Ajlouni S, Hijazi S. Iron status: a possible risk factor for the first febrile seizure. Epilepsia. 2002;43:740–743. DOI: 10.1046/j.1528-1157.2002.32501.x
32. Zareifar S, Hosseinzadeh HR, Cohan N. Association between iron status and febrile seizures in children. Seizure. 2012;21:603–605. DOI: 10.1016/j.seizure.2012.06.010
33. Papageorgiou V, Vargiami E, Kontopoulos E, Kardaras P, Economou M, Athanassiou-Mataxa M, et al. Association between iron deficiency and febrile seizures. Eur J Paediatr Neurol. 2015;19:591–596. DOI: 10.1016/j.ejpn.2015.05.009
34. Kodkani AO, Shemirani M, Head H, Karami M. The association between zinc levels in children's plasma and simple febrile seizures. J Pediatr Hematol Oncol. 2016;38:512–516. DOI: 10.1097/MPH.0000000000000646.
35. Ur-Rehman N, Biloo AG. Association between iron deficiency anemia and febrile seizures. J Coll Physicians Surg Pak. 2005;15(6):338–40.
36. Momen A, Nikfar R, Karimi B. Evaluation of Iron Status in 9-month to 5-year-old Children with Febrile Seizures: A Case-control Study in the South West of Iran. Iran J Child Neurol. 2010;4(2):45–50.

37. Kobrinsky NL, Yager JY, Cheang MS, Yatscoff RW, Tenenbein M. Does iron deficiency raise the seizure threshold? J Child Neurol. 1995;10:105–109. DOI: 10.1177/088307389501000207

38. Bidabadi E, Mashouf M. Association between iron deficiency anemia and first febrile convulsion: A case–control study. Seizure. 2009;18:347–351. DOI: 10.1016/j.seizure.2009.01.008

39. Yousefchajian P, Eghbali A, Rafiee M, Sharafkhah M, Zolfi M, Firouzifar M. The relationship between iron deficiency anemia and simple febrile convulsion in children. J Pediatr Neurosci. 2014;9:110. DOI: 10.4103/1817-1745.139276

40. Salehi Omran MR, Tamaddoni A, Nasehi MM, Babazadeh H, Alizadeh Navaei R. Iron status in febrile seizure: A case-control study. Iran J Child Neurology. 2009;40–43.

41. Amirsalari S, Keihanidost Z, Ahmadi M, Sabouri A, Kavemanesh Z, Afshar P. Relationship between Iron Deficiency Anemia and Febrile Seizures. Iran J Child Neurology. 2010;14(1):27–30.

42. Yadav D, Chandra J. Iron deficiency: Beyond anemia. Indian J Pediatr. 2011;78:65–72.

43. Johnston MV. Iron deficiency, febrile seizures and brain development. Indian Pediatr. 2012;49(1):13

44. Chen MH, Su TP, Chen YS, Hsu JW, Huang KL, Chang WH, Chen TJ, Bai YM. Association between psychiatric disorders and iron deficiency anemia among children and adolescents: A nationwide population-based study. BMC Psychiatry. 2013;13:161.

45. LeBlanc JJ, Fagiolini M. Autism: A "critical period" disorder? Neural Plast. 2011;921680.

46. Luscher B, Fuchs T, Kilpatrick CL. GABAA receptor trafficking-mediated plasticity of inhibitory synapses. Neuron. 2011;70:385–409.

47. Bollmann S, Ghisleni C, Poil SS, Martin E, Bald J, Eich-Hochli D, Edden RA, Klaver P, Michels L, Brandeis D, O’Gorman RL. Developmental changes in gamma-aminobutyric acid levels in attention-deficit/hyperactivity disorder. Transl Psychiatry. 2015;5:e589.

48. Lal Vikash, Kumar Haresh, Hanif Shahnaz, Parkash Om, Arwani Suneel. Association of iron deficiency anemia in children with febrile convulsions. Pakistan Journal of Neurological Sciences (PJNS). 2016;11(Iss.3). Article 10. Available: http://ecommons.aku.edu/pjns/vol11/iss3/10

49. Abdel Hameed ZA, El-Tellawy MM, Embaby M, Kamel YS. Relation of iron and zinc deficiencies to the occurrence of febrile convulsions. J Pediatr Neurosci. 2019;14(2):61–64. DOI: 10.4103/jpn.JPN_9_19

50. Fallah R, Tirandazi B, Akhavan Karbasi S, Golestan M. Iron deficiency and iron deficiency anemia in children with febrile seizure. Iran J Ped Hematol Oncol. 2013;3(1):200–203.

51. Elham Bidabadi, Mehryar Mashouf, Association between iron deficiency anemia and first febrile convulsion: A case–control study. Seizure. 2009;18(Issue 5):347–351, ISSN 1059-1311, Available: https://doi.org/10.1016/j.seizure.2009.01.008.(https://www.sciencedirect.com/science/article/pii/S1059131109000028)

52. Expert Committee on Pediatric Epilepsy, Indian Academy of Pediatrics. Guidelines for diagnosis and management of childhood epilepsy. Indian Pediatr. 2009;46:681–98.

53. Oluwabusi T, Sood SK. Update on the management of simple febrile seizures: emphasis on minimal intervention. Curr Opin Pediatr. 2012;24:259–65.

54. Lux AL. Treatment of febrile seizures: Historical perspective, current opinions, and potential future directions. Brain Dev. 2010;32:42–50.

55. National Institute for Health and Care Excellence. Feverish illness in children: Assessment and initial management in children younger than 5 years of age; Clinical Guideline No 160; Nice: London, UK; 2013.

56. Paul SP, Blaikley S, Chinthapalli R. Clinical update: Febrile convulsion in childhood. Community Practitioner. 2012;85:36–38.
57. National Institute for Health and Care Excellence. Clinical Knowledge Summaries: Febrile Seizures; NICE: London, UK; 2013.
58. Royal College of Nursing. Caring for Children with Fever. RCN good practice guidance for nurses working with infants, children, and young people; RCN: London, UK; 2013.
59. Deng H, Zheng W, Song Z. The genetics and molecular biology of fever-associated seizures or epilepsy. Expert Rev. Mol. Med. 2010;20:e3.
60. Strengell T, Uhari M, Tarrka R. Antipyretic agents for preventing recurrences of febrile seizures: Randomized controlled trial. Arch. Pediatr. Adolesc. Med. 2009;163:799–804.
61. Chung S. Febrile seizures. Korean J. Pediatr. 2014;57:384–395.
62. Özdemir N. Iron deficiency anemia from diagnosis to treatment in children. Turk Pediatri Ars. 2015;50(1):11-19. Published 2015 Mar 1. DOI: 10.5152/tpa.2015.2337