

Determine Mean Serum Ferritin Level in Children with Febrile Seizures and Compare with Children without Seizures

SHAMSULLAH BAZAI¹, SAQIB KHALIL², NIGHAT JABEEN³, MUBEENA JAVED⁴, MUHAMMAD SHAHEER MANNAN⁵, IBRAHIM⁶

¹Professor, Department of Ophthalmology, Helpers Teaching Institute, Quetta, Balochistan

²Assistant Professor, Women Medical College Abbottabad, Consultant Neurosurgeon Jinnah International Hospital Abbottabad

³Assistant Professor of Pediatrics, Quetta Institute of Medical Sciences

⁴Doctor, Department of Pediatrics, Allama Iqbal Medical College/ Jinnah Hospital, Lahore

⁵Doctor, Department of Pediatrics, CMH Lahore

⁶Assistant Professor, Paeds Medicine, Swat Medical College/Swat Medical Complex Teaching Hospital Saidu Sharif Swat

Corresponding author: Dr Saqib Khalil, Email: drskjadoon1980@gmail.com, Cell: +923325896532

ABSTRACT

Objective: To compare the mean serum ferritin level in children with febrile seizures and without febrile seizures.

Study Design: Cross sectional/case control

Place & Duration: Swat Medical Complex Teaching Hospital Saidu Sharif Swat/CMH Lahore from the period January 2021 to June, 2021

Methods: 140 children with ages 5 to 60 months were enrolled in this study. All the patients were equally divided into two groups. Group I consist of 70 patients with febrile seizures and group II with same patients without febrile seizures. Complete blood picture and serum ferritin level was examined and compare the findings between both groups. Data was analyzed by SPSS 24.0.

Results: In group I 42 (60%) patients were male and 28 (40%) were females with mean age 24.26±10.38 months and in group II 40 (57.14%) were males and 30 (42.86%) were females with mean age 23.65±11.56 months. Mean serum ferritin level was significantly lower in group I patients than group II 24.48±10.82ng/ml Versus 42.45±12.64ng/ml with p-value <0.05. Iron deficiency was higher in patients with febrile seizures than patients with without seizures 22 Vs 10.

Conclusion: It is concluded that children with febrile seizure had significantly lower serum ferritin level and higher iron deficiency rate as compared to children without seizure.

Keywords: Febrile Seizures, Febrile Illness, Serum Ferritin Level, Hemoglobin, Iron Deficiency

INTRODUCTION

Seizures accompanied by fever but without a central nervous system infection or metabolic condition are referred to as febrile seizures. Epilepsy in the first five years of life affects 2% to 5% of the population [1]. With uncomplicated febrile seizures, there is no evidence of increased mortality, hemiplegia, or cognitive impairments [2]. Frequent daycare attendance, viral illnesses, a family history of febrile seizure, specific immunizations, and nutritional deficiencies, such as iron and zinc, have all been linked to an increased risk of febrile seizures in previous research [3–8]. The incidence of febrile seizures varies from region to region. The recent 5-year prevalence of febrile seizures in South Korea was 6.92 percent, which is slightly higher than the global average of 2–5 percent [9]. In spite of the benign nature of the ailment, patients and their loved ones may have a terrifying experience and endure high levels of anxiety as a result. Iron deficiency most commonly manifests as anaemia, but it can also impact other organs and systems. It's possible that iron deficiency can cause a wide range of mental and behavioural issues, including cognitive dysfunction and psychomotor retardation [10]. An iron deficiency in a developing brain can cause a variety of symptoms, including abnormalities in the hippocampus's neuronal development, a lack of energy in the brain, delays in the maturation of myelin fibres, and abnormalities in synaptic neurotransmitter systems such as norepinephrine and serotonin. [11] Most studies examining the link between iron deficiency and febrile seizures have found inconsistent results when comparing the iron status of children with and without seizures who are experiencing a fever episode. In this study, ferritin levels were compared between children who had febrile seizures and those who didn't.

MATERIAL AND METHODS

This cross sectional study was conducted at Swat Medical Complex Teaching Hospital Saidu Sharif Swat/CMH Lahore from the period January 2021 to June, 2021. This study included a total of 140 children, ranging in age from 5 months to 60 months, who presented either with or without febrile seizures. The children's ages ranged from 5 months to 60 months. After obtaining written agreement from all of the patients' parents or guardians, extensive

demographic information about patients was gathered. This information included patients' ages, genders, weights, and socioeconomic status. Patients were split up into two groups in a random manner. Group I consists of 70 patients who are experiencing their first seizure, while Group II consists of 70 patients who have not yet had any seizures (febrile illness). Patients who were taking iron supplements, patients who had chronic systemic disorders, patients who had a history of febrile seizures, patients who had meningitis or encephalitis, and patients who had a neurodevelopmental delay were not eligible for the study.

All of the patients had a sample of 3 millilitres of their blood drawn and sent off to the laboratory so that the haemoglobin level, mean corpuscular volume, mean corpuscular haemoglobin, and serum ferritin level could be analysed. A blood ferritin level of less than 20ng/mL was used to indicate iron deficiency.

SPSS 24.0 was used to perform the analysis on all of the data. The formula used was mean standard deviation. Tabulations were used to record the frequencies and percentages of the occurrences. The Chi square test and the student t-test were used to analyse the data from the laboratory experiments and determine whether group had a higher blood ferritin level. A p-value of less than 0.05 was considered to be significant.

RESULTS

In group I 42 (60%) patients were male and 28 (40%) were females with mean age 24.26±10.38 months and in group II 40 (57.14%) were males and 30 (42.86%) were females with mean age 23.65±11.56 months. Mean weight in group I was 10.95±3.48 kgs and in group II it was 11.281±2.54 Kgs. In group I 35 (50%) patients had low socio-economic status, 27 (38.57%) patients had middle status and 8 (11.43%) patients had high socio-economic status. In group II 30 (42.86%), 31 (44.29%) and 9 (12.86%) patients had low, middle and high socio-economic status. (Table 1)

Mean haemoglobin level was lower in group I 10.46±1.78g/dl as compared to group II 11.74±0.89g/dl, a significant difference observed between both groups with p-value <0.001. No significant difference was observed regarding mean corpuscular volume (MCV) between both groups I and II (66.96±11.52fl Versus 67.04±11.48fl). Mean corpuscular haemoglobin (MCH) in group I

was 21.35 ± 2.86 pg and in group II it was 22.24 ± 3.58 pg (p-value 0.06). A significant difference was found regarding mean serum ferritin level between both groups I and II 24.48 ± 10.82 ng/ml Versus 42.45 ± 12.64 ng/ml with p-value < 0.0001 . (Table 2)

34 (48.58%) patients in group I had serum ferritin level < 20 ng/mL and in group II 17 (24.29%) patients had serum ferritin level < 20 ng/mL. A significant difference was observed between both groups regarding iron deficiency with p-value 0.024. (Figure 1)

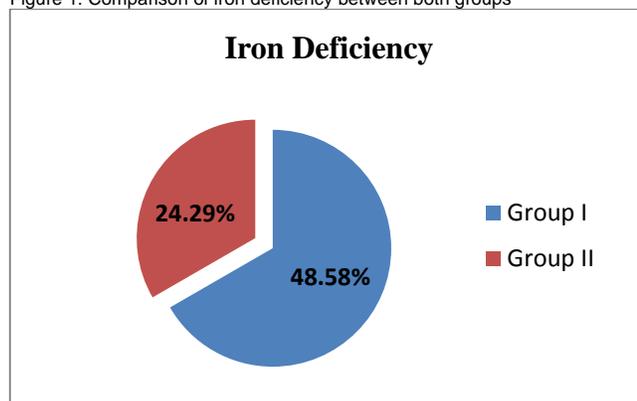
Table 1: Demographical details of all the patients

Characteristics	Group I	Group II	P-value
Mean Age (Months)	24.26 ± 10.38	23.65 ± 11.56	0.07
Gender			
Male	42 (60%)	40 (57.14%)	> 0.05
Female	28 (40%)	30 (42.86%)	> 0.05
Mean Weight (Kgs)	10.95 ± 3.48	11.281 ± 2.54	> 0.05
Socio-eco Status			
Low	35 (50%)	30 (42.86%)	> 0.05
Middle	27 (38.57%)	31 (44.29%)	> 0.05
High	8 (11.43%)	9 (12.86%)	> 0.05

Table 2: Comparison of HB, MCV, MCH and Mean serum ferritin level between both groups

Characteristics	Group I	Group II	P-value
Hb (g/dl)	10.46 ± 1.78	11.74 ± 0.89	< 0.05
MCH (pg)	21.35 ± 2.86	22.24 ± 3.58	0.06
MCV (fl)	66.96 ± 11.52	67.04 ± 11.48	> 0.05
Mean Serum Ferritin Level (ng/mL)	24.48 ± 10.82	42.45 ± 12.64	< 0.0001

Figure 1: Comparison of iron deficiency between both groups



DISCUSSION

Iron plays an important role in children neurodevelopment and iron deficiency is a major adverse event in children with ages 5 months to 6 years. Febrile seizure is one of the most frequent life threatening disorder in children with ages upto 6 years [12,13]. The present study was conducted aimed to compare the mean serum ferritin level in children with febrile seizure and without seizure. In this regard 70 patients with febrile seizure and 70 patients without seizure were analyzed. Male patients were high in numbers in both groups I and II 60% and 57% as compare to females 40% and 43%. Mean age of patients in cases was 24.26 ± 10.38 months and in controls it was 23.65 ± 11.56 months. No significant difference was observed regarding age, gender, weight and socioeconomic status between cases and controls. These results showed similarity to many of previous studies in which male patients were predominant 55%-70% as compared to females and the average age of patients was 22.4 months [14-15].

In present study according to the laboratory examination we found that Mean haemoglobin level was lower in cases 10.46 ± 1.78 g/dl as compared to controls (group II) 11.74 ± 0.89 g/dl, a significant difference observed between both groups with p-value < 0.001 . No significant difference was observed regarding mean

corpuscular volume (MCV) between both groups I and II (66.96 ± 11.52 fl Versus 67.04 ± 11.48 fl). Mean corpuscular haemoglobin (MCH) in group I was 21.35 ± 2.86 pg and in group II it was 22.24 ± 3.58 pg (p-value 0.06). A study conducted by Qammar M et al [16] reported Hb level in febrile seizure children was higher as compared to children without febrile seizure 9.69 ± 1.59 g/dl Vs 8.53 ± 2.08 g/dl with p-value < 0.05 . They also reported no significant difference regarding MCV and MCH between both groups.

In our study we found a significant difference regarding mean serum ferritin level between both groups. Serum ferritin level was significantly lower in patients with febrile seizure 24.48 ± 10.82 ng/ml as compared to patients without seizure (controls) 42.45 ± 12.64 ng/ml with p-value < 0.0001 . These results were similar to the study by Qamar M et al [16]. A study conducted by Fallah R et al [17] regarding mean serum ferritin level in children with febrile seizures and without febrile seizures, in which they reported that mean serum ferritin level was lower in patients with febrile seizures 48.91 ± 22.96 ng/mL as compared to controls 75.13 ± 35.57 ng/mL. Some other previous study demonstrated that serum ferritin level was significantly lower in children with febrile seizure 50% to 70% as compared to children without seizures [18-20].

In present study we found that 34 (48.58%) patients in group I had serum ferritin level < 20 ng/mL and in group II 17 (24.29%) patients had serum ferritin level < 20 ng/mL. A significant difference was observed between both groups regarding iron deficiency with p-value 0.024. These results were similar to several previous studies in which iron deficiency had significant association with febrile seizures [21-22].

CONCLUSION

The findings of this study led us to the conclusion that patients suffering from febrile seizures had considerably lower levels of serum ferritin and haemoglobin compared to children who did not have seizures. In addition, children who have had their first episode of either febrile or afebrile seizures should have their iron status examined.

REFERENCES

- Mikati MA. Seizures in Childhood. In: Kliegman RM, Stanton BF, Schor NF, St. Geme JW, Behrman RE, editors. Nelson Textbook of Pediatrics, 19th edition, Philadelphia: Saunders; 2011, p. 2013–2017.
- Yadav D, Chandra J. Iron deficiency: beyond anemia. Indian J Pediatr., 2011; 78(1): 65–72.
- Johnston MV. Iron deficiency, febrile seizures, and brain development. Indian Pediatr., 2012; 49(1): 13–4.
- Idro R, Gwer S, Williams TN, Otieno T, Uyoga S, Fegan G, Kager PA, Maitland K, Kirkham F, Neville BG, Newton CR. Iron deficiency and acute seizures: results from children living in rural Kenya and a meta-analysis. PLoS One, 2016; 5(11): e14001.
- Carvalho AG, Lira PI, Barros Med F, Aléssio ML, Lima Mode C, Carbonneau MA, Berger J, Léger CL. Diagnosis of iron deficiency anemia in children of Northeast Brazil. Rev Saude Publica. 2010; 44(3): 513–9.
- Johnston MV. Iron deficiency, febrile seizures, and brain development. Indian Pediatr., 2012; 49(1): 13–4.
- Idro R, Gwer S, Williams TN, Otieno T, Uyoga S, Fegan G, Kager PA, Maitland K, Kirkham F, Neville BG, Newton CR. Iron deficiency and acute seizures: results from children living in rural Kenya and a meta-analysis. PLoS One, 2016; 5(11): e14001.
- Kumari P, Nair MK, Nair SM, Kailas L, Geeta S. Iron deficiency as a risk factor for simple febrile seizure – A case-control study. Indian Pediatr 2012; 49:17–1.
- Byeon JH, Kim GH, Eun BL. Prevalence, incidence, and recurrence of febrile Seizures in Korean children based on national registry data. J Clin Neurol. 2018;14:43–7.
- Ghasemi F, Valizadeh F, Taei N. Iron- deficiency anemia in children with febrile seizure: a case-control study. Iran J Child Neurol. 2014;8:38–44.
- 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;19:591–6.

12. Yousefichaijan P, Eghbali A, Rafeie 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.
13. Morales-Ruán Mdel C, Villalpando S, García-Guerra A, Shamah-Levy T, Robledo-Pérez R, Avila-Arcos MA, Rivera JA. Iron, zinc, copper and magnesium nutritional status in Mexican children aged 1 to 11 years. *Salud Publica Mex* 2012; 54(2):125-34.
14. Akbayram S, Cemek M, Büyükben A, Aymelek F, Karaman S, Yilmaz F, Dogan M, Caksen H. Major and minor bio-element status in children with febrile seizure. *Bratisl Lek Listy* 2012; 113 (7):421-3.
15. Karimi P, Badfar G, Soleymani A, Khorshidi A. Association of iron deficiency anemia and febrile seizure in Asia: a systematic review and meta-analysis. *Iran J Neonatol*. 2018;9:42-52.
16. Malla T, Malla KK, Sathian B, Chettri P, Singh S, Ghimire A. Simple febrile convulsion and iron deficiency anemia A co-relation in Nepalese Children. *Am J Public Health Res* 2015;3:11-16.
17. Qamar M, Masood N, bano T, Mahmood S. Comparison of Mean Serum Ferritin Level in Children with Febrile Seizure and without Seizures. *Pak Pediatr J* 2019;43 (3): 169-73.
18. Fallah R, Tirandazi F, Ferdosian F, Fadavi N. Iron Deficiency And Iron Deficiency Anemia in Children With First Attack of Seizure and on Healthy Control Group : A Comparative Study. *Iran J Child Neurol*. 2014 Summer;8(3): 18-23.
19. Han Na Jang, Hoi Soo Yoon and Eun Hye Lee. Prospective case control study of iron deficiency and the risk of febrile seizures in children in South Korea. *BMC Pediatrics* (2019) 19:309.
20. 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.
21. Ahmed WB, Hanoudi MB, Ibrahim AB. Risk factors in children with febrile seizures and their iron status. *JPMA* April 2019, Volume 69, Issue 8.
22. C. Krishnamurthy, J. Rukmani, Syed Ali Fathima. Comparative study of serum ferritin level in simple and complex febrile seizures in Government Tirunelveli Medical College. *IAIM*, 2019; 6(3): 13-17.