Evaluation of iron status in children with first febrile seizures

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Abstract: Background: Febrile seizure is the most common convulsive disorder in children which strikes 2% to 5% of children between 3 to 60 months of age, the etiology of febrile seizures is not clear. Different factors have been considered including familial (genetic) factors, prenatal factors, present acute illness, the highest degree of fever and finally, anemia. Iron deficiency anemia, as the most common type of anemia during infancy and childhood, occurs usually between 9- 24 months of age and this period coincides with the peak incidence of febrile seizures. Because of the controversies regarding the positive or negative effect of iron on the occurrence of febrile seizures, we decided to study Evaluation of iron status in children with first febrile seizure aged 24 month to 5 year. **Aim of the work:** The main objective is to evaluate iron status in children with first febrile convulsion**. Results:** the present study is a case control study that was conducted kafr-elshikh fever hospitals on 50 children with a febrile convulsions as a case group and 50 children with a cut febrile illness but without convulsions as a control group. there were significant difference between patients and control group regarding RBCs count, Hb, MCV, MCH, MCHC and serum ferritin level with lower levels in patients compared with control and there were significant difference between patients and control group regarding RDW with higher levels in patients compared with control. **Conclusion:** Febrile seizure is more commen in children with iron deficiency as iron deficiency seems to be an important risk factor for development of febrile convulsions.
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Key words: febrile convulsions, Iron deficiency, children.

1. Introduction:

Febrile convulsion, is a seizure associated with a high body temperature but without any serious underlying health issue They most commonly occur in children between the ages of 6 months and 5 years (1). Febrile seizures occur in children between 6 months and 5 years of age, without clinical evidence of intracranial infection, metabolic disorders or previous history of a febrile seizures. Several risk factors have been associated with the occurrence of febrile seizure: history of febrile or a febrile seizures in first- or second-degree relatives, day care attendance, developmental delay, and neonatal nursery stay longer than 30 days. Children with two of these risk factors have a 28% chance of having at least one febrile seizure (3). Iron insufficiency has a possible role in the occurrence of first seizures in developing world (4). Iron deficiency (ID) is the most common micronutrient deficiency worldwide and young children are a special risk group because their rapid growth leads to high iron requirements(5).

2. Patient and methods:

This study was conducted on 50 children with first febrile seizure who were admitted to kafr-elshikh fever hospital during 2015 including 22 males 44% and 28 females 56% with their age ranged from 24months - 5 years and mean age value 35.26 ± 7.3. and 50 children as control group, including 25 males 50% and 25 females 50% with their age ranged from 24 months - 5 years and mean age value 40.7 0± 9.2 have a febrile illness (such as upper and lower respiratory tract infections and gastro enteritis) but without seizures**.**

Inclusion criteria:

1- All cases with first febrile convulsions.
2- aged between 2 years and 5 years.
3- Both genders.

Exclusion criteria:

1- Signs of developmental delay.
2- Cases on iron therapy.

All children will be subjected to the following:

1- History taking: personal history, complaint, history of present illness in the form of duration of convulsion, type of convulsion, symptoms of increased intra cranial tension, level of consciousness, postictal stage, history of developmental delay and history of drug intak. past history of similar attack of febrile convulsions. family history of febrile convulsions.

2- Careful physical and neurological examination: mental state, cranial nerves, motor

system in the form of tone, power, reflexes and coordination of the muscle.

3-Blood samples were collected from all participants for measurements of:

- **Complete blood count**:
  - Hemoglobin (HB).
  - Red blood cells (RBCs) indices:
  - Mean corpuscular volume (MCV).
  - Mean corpuscular hemoglobin (MCH).
  - Mean corpuscular hemoglobin concentration (MCHC).
  - Red blood cell distribution width (RDW).

Serum ferritin level.

Specimen collection, storage and handling:

1. Blood specimens (3cm venous bloods samples) where taken from each patient and were collected in plain tube using sterile needles through gentle venipuncture after sterilization of site of puncture by alcohol, and collected samples were allowed to clot for 4 minutes then centrifuged to separate clear non hemolyzed serum **(6).**
2. Specimen could be refrigerated at 2-8 °C for up to five days or stored at -20 °C up to six months with avoidance of repeated freeze and throw **(6).**
3. The serum samples were isolated in sterile test tubes using micropipette with sterile disposable tips. Each sample was labeled and given a serial number together with the patient name **(7).**

- **Serum ferritin test:** Serum level of ferritin by ELIZA [DRG® Ferritin ELISA (EIA-4292)] **(8).**

Principle of the test

Anti-human-ferritin antibodies are bound to microwells. Ferritin, if present in diluted serum or plasma, bind to the respective antibody. Washing of the microwells removes unspecific serum and plasma components. Horseradish peroxidase (HRP) conjugated anti-human ferritin immunologically detects the bound specimen sample ferritin forming a conjugate/ferritin/antibody complex. Washing of the microwells removes unbound conjugate. An enzyme substrate in the presence of bound conjugate hydrolyzes to form a blue color. The addition of an acid stops the reaction forming a yellow end-product. The intensity of this yellow color is measured photometrically at 450 nm. The amount of color is directly proportional to the concentration of ferritin present in the original sample **(8).**

Results:

There were significant difference between patients and control group regarding RBCs count, Hb, MCV, MCH, MCHC and serum ferritin level with lower levels in patients compared with control.

There were significant difference between patients and control group regarding RDW with higher levels in patients compared with control.

- The mean of RBCs count of patients is (4.49 ± 0.3) lower than control (4.66 ± 0.4) with p value (0.018).
- The mean of Hg% of patients is (10.57 ± 1.1) lower than control (11.8 1± 0.6) with p value (<0.001).
- The mean of MCV of patients is (71 ± 7.3) lower than control (75.03 ± 6.2) with p value (0.003).
- The mean of MCH of patients is (23.76 ± 2.9) lower than control (25.58 ± 2.4) with p valu (0.001).
- The mean of MCHC of patients is (33.39 ± 1.2) lower than control (34.09± 1.1) with p value (0.003).
- The mean of RDW of patients is (14.89± 1.9) higher than control (12.85 ± 0.5) with p value (<0.001).
- The mean of serum ferritin of patients is (57.85 ± 20.2) lower than control (68.70± 18.1) with p value (0.006).

Demographic data:

		Patients	controls	P valu
		No.=50	No.=50	
Age distribution	Mean ± SD	35.26 ± 7.2	40.70± 9.2	0.002
	Range	24-55	24-60	
Sex distribution	Male	22-44%	25-50%	0.552
	female	28-56%	25-50%	

Complete blood count:

		Patients	controls	p valu
		No.=50	No.=50	
HB%	Mean ± SD	10.5 ± 1.1	11.8 1± 0.6	<0.001
	Range	8.50-13.30	10.30-13.2	
RBCS	Mean ± SD	4.49 ± 0.3	4.66 ± 0.4	0.018
	Range	3.60-5.08	4.23-5.60	
MCV	Mean ± SD	71 ± 7.3	75.03 ± 6.2	0.003
	Range	59.80-84.60	58.30-82.50	
MCH	Mean ± SD	23.76 ± 2.9	25.58 ± 2.4	0.001
	Range	18.40-29.20	18.40-29.20	
MCHC	Mean ± SD	33.39 ± 1.2	34.09± 1.1	0.003
	Range	30.40-35.80	31-36.40	
MCHC	Mean ± SD	33.39 ± 1.2	34.09± 1.1	0.003
	Range	30.40-35.80	31-36.40	
RDW	Mean ± SD	14.89± 1.9	12.85 ± 0.5	<0.001
	Range	12.20-19.40	12.10-15.30	

Serum ferritin:

		Patinets	controls	P valu
		No.=50	No.=50	
SERUM FERRITIN	Mean ± SD	57.85 ± 20.2	68.70± 18.1	0.006
	Range	23.40-98.80	39.10-107.6	

Discussion:

In the current study, there were significant difference between patients and control group regarding RBCs count, Hb, MCV, MCH and MCHC levels with lower levels in patients compared with control as following:

The mean of RBCs count of patients is (4.49 ± 0.3) lower than control (4.66 ± 0.4) with p value (0.018).

The mean of Hg% of patients is (10.57 ± 1.1) lower than control (11.8 1± 0.6) with p value (<0.001).

The mean of MCV of patients is (71 ± 7.3) lower than control (75.03 ± 6.2) with p value (0.003).

The mean of MCH of patients is (23.76 ± 2.9) lower than control (25.58 ± 2.4) with p value (0.001).

The mean of MCHC of patients is (33.39 ± 1.2) lower than control (34.09± 1.1) with p value (0.003).

This is in agreement with (Naveed-ur-Rehman and Billoo) (9), (Daoud et al) (10), (Momen et al) (11), (Pisacane et al) (12) found RBCs count, Hb level, MCV, MCH and MCHC lower in patients with febrile convulsion compared with control group.

This is not in agreement with (Talebian et al) (13), (Bidabadi and Mashouf) (14), (Kobrinsky et al) (15) found RBCs, Hb level, MCV. MCH and MCHC is higher in patients with febrile convulsion compared with control group.

In the current study, there were significant difference between patients and control group regarding serum ferritin with lower levels in patients compared with control as following:

The mean of serum ferritin of patients is (57.85 ± 20.2) lower than control (68.70± 18.1) with p value (0.006).

This is in agreement with (Momen et al) (11), (Pisacane et al) (12), (Vaswani et al) (16), (Modaresi et al) (17). found serum ferritin level lower in patients with febrile convulsion compared with control group.

This is not in agreement with **(**Abaskhanian et al) (18), (Bidabadi and Mashouf) (19) found serum ferritin level higher in patients with febrile convulsion compared with control group.

Conclusion:

Febrile seizure is more commen in children with iron deficiency as iron deficiency seems to be an important risk factor for development of febrile convulsions.

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