

Study of Hematological Parameters and Risk Factors for Febrile Seizure Among Sudanese Children

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Abstract: Current study aims to compare hematological parameters between children with febrile seizures and to find their common etiology among Sudanese children. In a case control study 150 children who were admitted to Gafar Ibn-Ouf pediatrics specialized hospital and Omdurman emergency pediatrics hospital during the period from Jun- Aug 2015 were studied. This study showed low levels of all hematological parameters in febrile seizures patients with exception of red distribution width (RDW), platelets and total iron binding capacity (TIBC) compared to their reference copartners. This evidence can be regarded as a risk factor for seizures in febrile children. The study also detected that children with low hematological levels of these parameters had a family history of febrile seizures and the consanguinity was associated with higher peak body temperature.

Keywords: Febrile Seizures, Children, Risk Factors and Iron Status

1. Introduction

Febrile seizures is an event in infancy or childhood usually occurring between three months and five years of age, associated with fever but without evidence of intracranial infection or defined cause for the seizure [1,2,3]. The combination of fever and convulsions in infants is one of the most common emergency in the tropical countries [4,5,6]. It is not known how or why seizures are generated in response to fever; it may be due to fever-induced factors (e.g., interleukin-1 β) which are proconvulsants in individuals who are susceptible based upon the stage of brain development and genetic susceptibility [4,5]. Certain ion channels in the brain are temperature sensitive and may generate fever-associated synchronized neuronal activity [7,8]. There is also evidence to suggest that hyperthermia-induced hyperventilation and alkalosis may play a role [9,10].

The majority of children have their febrile seizures on the first day of illness and, in some cases; are the first

manifestations of the child illness. The degree of fever associated with febrile convulsions is variable, and approximately 25 % of events occur when the temperature is between 38°C and 39°C. They are often seen as the temperature is increasing rapidly but may develop as the fever is declining [11].

Febrile seizures can occur during both viral and bacterial infections. The incidence of febrile seizures was similar with influenza, adenovirus, and parainfluenza infections and somewhat less common with respiratory syncytial virus and rotavirus. Hemoglobin, serum iron, ferritin levels were lower in febrile seizures patients than the control group [13,14].

There are many risk factors associated with febrile seizures and their recurrence. Researches of the association between iron deficiency and seizures have shown many controversies. This study aimed to compare between hematological parameters of children with a first seizure attack and control group and to detect the common diseases leading to febrile seizures among Sudanese children.

2. Patients and Methods

In a case control study 150 children who were admitted for febrile illnesses to Gafar Ibn Ouf pediatrics specialized hospital and Omdurman emergency pediatrics hospital during the period from Jun- Aug 2015 were studied. 75 children with febrile seizure were considered as cases. The remaining 75 patients of the study sample taken as reference group from children who were admitted for febrile illnesses without convulsions. Age of cases and controls were (24.36±17.01, 25.19±17.97) months. Children with seizures due to central nervous system infection, metabolic cause, afebrile seizures, on recent iron therapy or have other causes of anemia, presence of any chronic systemic diseases and having neurodevelopmental delay, previous febrile seizures and acute central nervous system infection (meningitis, encephalitis) were excluded.

Body weight, height, mean of temperature peak at admission, and the underlying illness were recorded for all cases and controls. Blood samples were collected from all participants for hemoglobin (HB), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW), serum ferritin (SF), serum iron (SI), and total iron binding capacity (TIBC). SF, SI, TIBC were done on the referral lab at Khartoum Teaching Hospital. SF level was measured by using the IMx Ferritin assay in micro particle enzyme immunoassay (MEIA) for quantitative determination of human SF. While, SI, and TIBC were measured by using analyzer, spectrophotometer (BT5- 305).

The data was processed statistically by using statistical package for social science (SPSS). Paired T test was conducted; results were expressed in frequency and percentage and Mean ±SD. P. value < 0.05 was considered to indicate significant.

3. Results

At $P \leq 0.05$ body temperature were statically significant P value 0.001 with mean (39.07±0.60, 38.70±0.59) for case and control. While, body weight and height showed no significant between both groups P values 0.233 and 0.702 with Mean (10.42±3.09, 11.03±3.10) and (82.96±1.18, 83.72±1.2) respectively Table 1. Also this study revealed significant

differences (P value 0.001, 0.003) in all hematological parameters between case and control group with mean of Hb (9.94±1.85, 11.14±1.81)g/dl Mean Corpuscular Volume (MCV) (70.06±8.10, 75.94±8.88) fl, Mean Corpuscular Hemoglobin (MCH) (22.74±3.67, 25.41±4.06) pg, mean corpuscular hemoglobin concentration (MCHC) (28.54±4.78, 31.12±4.95) g/dl, serum Ferritin (SF) (16.57±13.84, 19.76±10.45) µg/ml, serum Iron (SI) (38.97±32.92, 52.39±30.40) mcg/dl. While, Red Distribution width (RDW) (16.22±3.61, 13.94±3.67), Platelet (424.57±136.21, 363.31±91.84), Total Iron Binding Capacity (TIBC) (4.17±8.66, 3.69±9.00) mcg/dl were significantly higher among case group (Table2)

Table 1. Body Temperature, Weight and Height among study participants.

	Case Mean± SD	Control Mean± SD	P. Value
Temperature C°	39.07±0.60	38.70±0.59	0.001
Weight	10.42±3.09	11.03±3.10	0.233
Height	82.96±1.18	83.72±1.2	0.702

Table 2. Distribution of different variables between cases and control.

	Case mean± SD	Control Mean± SD	P value
Hb g/dl	9.94±1.85	11.14±1.81	0.001
Mean Corpuscular Volume (MCV) fl	70.06±8.10	75.94±8.88	0.001
Mean Corpuscular Hemoglobin (MCH) pg	22.74±3.67	25.41±4.06	0.001
Mean Corpuscular Hemoglobin Concentration. (MCHC) g/dl	28.54±4.78	31.12±4.95	0.003
Red Distribution width(RDW)	16.22±3.61	13.94±3.67	0.001
Platelet	424.57±136.21	363.31±91.84	0.000
Serum Ferritin (SF) ng/ml	16.57±13.84	19.76±10.45	0.003
Serum Iron (SI) mcg/dl	38.97±32.92	52.39±30.40	0.001
Total Iron Binding Capacity (TIBC) mcg/dl	4.17±8.66	3.69±9.00	0.001

Underlying illnesses among cases and controls are detailed in table 3. Consanguinity was found in 44.2% of control group compared to 55.5% of the cases, Table 4.

Table 3. Contributory factors for febrile seizure.

Disease	Gastroenteritis	Lower respiratory tract infections	Lymphadenitis	Measles	Otitis media	Tonsillitis	Upper respiratory tract infections	Urinary Tract infection	Nonspecific underlying illness
Case (N)	4	16	0	0	0	15	32	5	3
Control (N)	22	15	2	5	4	7	8	5	5

Table 4. Consanguinity and family history among study population.

Consanguinity %	Control	Case
	44.2	55.8
Family history of febrile seizure %	48	52

4. Discussion

The mean peak temperature is significantly high among cases. This can be explained by Eun, et al [15], prolonged febrile seizures (FS) have both acute and long-lasting because they are often associated with peripheral infection. Peripheral

inflammation appears to work synergistically with hyperthermia to potentiate seizures and to exacerbate seizure-induced immune responses. This study showed low levels of all hematological parameters in febrile seizure patients with exception of red distribution width (RDW), platelet and total iron binding capacity (TIBC) compared to their reference copartners and this might be a risk factor for development seizures in children. Our study revealed that although anemia was not common among febrile seizures patients, iron deficiency was more frequent in these patients.

Upper respiratory tract infections (URTI) found to be the most common illness leading to febrile seizures among study sample children. Patients with febrile seizures were significantly more likely to have URTI than febrile controls that did not have a seizure. This is not unexpected because viral illnesses causing URTI symptoms such as influenza A and human herpes virus 6 are more likely to be associated with febrile seizures.

A genetic susceptibility to seizures with fever and family history of epilepsy were higher among cases than controls in this study, but the differences were not statistically significant. Genetic and familial factors appear to be important factors in the expression of febrile convulsions and the subsequent development of epilepsy in some children [16]. Our study found a family history of febrile seizures in 26% of cases compared to 13% of controls and no statistically significant differences in family history of febrile seizures between cases and controls.

5. Conclusion

The study showed low levels of all hematological parameters in febrile seizure patients with exception of red distribution width, platelet and total iron binding capacity (TIBC) compared to their reference copartners. It also revealed that children with low hematological levels had a family history of febrile seizures and prone to febrile seizures. Moreover consanguinity showed higher peak body temperature and upper respiratory tract infections are predominant causative factors for febrile seizure.

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