

# RESEARCH ARTICLE

## WHICH CASE OF GASTROENTERITIS ENDS IN CONVULSION?

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**Abstract:**

**Objective**

Gastroenteritis has a diverse etiology; many pathogens can cause this condition. Of the extraintestinal manifestations, one is convulsions, which may be attributable to fever, type of bacteria, or electrolyte imbalance. To assess the risk of occurrence of convulsions, in this study we investigated the association between the paraclinical and clinical findings of children with gastroenteritis and the risk of occurrence of convulsions.

**Materials & Methods**

In this prospective study, conducted between March 2004 and February 2005, we studied 50 patients admitted to the Mofid Childrens' Hospital, with gastroenteritis and convulsions.

Stool samples were obtained for investigations of electrolyte imbalances and type of gastroenteritis. A control group consisting of patients admitted simultaneously with gastroenteritis but no convulsions was selected as well. They were matched with the case group in terms of age, sex, and month of admission and number. Data was collected using a specific checklist.

**Results**

The stool exam (SE) showed 31 cases (62%) had inflammatory diarrhea and 19 (38%) had the non-inflammatory type. In the control group, 21 cases (42%) had inflammatory and 29 (58%) had non-inflammatory diarrhea. Stool culture (SC) results showed 11 (22%) subjects had Shigella, 27 (54%) revealed no organism, and 12 (24%) did not have SCs in their medical records. In the control group SC results revealed Shigella in 2 cases (4%), 38 patients (76%) showed no organism, and 10 (20%) did not have SCs. Six cases (12%) had hyponatremia ranging between 125-130meq/lit. In the control group, 4 (8%) had electrolyte imbalances, 3 had hyponatremia ranging between 125-130meq/lit, and 1 had hypokalemia.

**Conclusion**

No significant relation was found between inflammatory gastroenteritis and the incidence of convulsion (P value= 0.0716) Although a significant relation was found between Shigella and convulsion (P value= 0.0113), no significant relation existed between electrolyte imbalance and the incidence of convulsion (P value= 0.7389).

**Key words:** gastroenteritis, convulsion, shigellosis, fever.

### Introduction

Gastrointestinal infections are caused by a wide variety of pathogens. Diarrheal diseases are one of the leading causes of mortality and morbidity in children and convulsions are one of the complications. Children may develop febrile seizures if fever accompanies the diarrhea(1). Sometimes afebrile seizures have been known to occur in association with dehydration, electrolyte imbalance, hypoglycemia or hypocalcaemia and complicated acute gastroenteritis; however the occurrence of afebrile seizures during viral gastroenteritis without dehydration or electrolyte imbalance has also been reported(2).

Considering the fact that convulsions associated with gastroenteritis may be attributable to fever, the type of bacteria, dehydration, or electrolyte imbalance, we designed this study to evaluate the relation between some paraclinical and clinical findings and convulsions, with the aim of estimating the risk of occurrence of convulsions and to assist in its prompt diagnosis and preventive measures.

### Materials & Methods

This prospective case control study included all patients with gastroenteritis and convulsions admitted between March 2004 and February 2005 to Mofid Children's hospital, Tehran, Iran: these included patients admitted with gastroenteritis and convulsion, those with gastroenteritis who had a convulsion while hospitalized and those admitted with febrile convulsion and presented with gastroenteritis during the first 48 hours. All patients with convulsions were examined by a child neurologist. The seizure type was generalized tonic clonic and its duration was less than 15 minutes. Patients with underlying diseases who had a high risk of convulsion (such as cerebral palsy, metabolic diseases, etc.) were excluded from study.

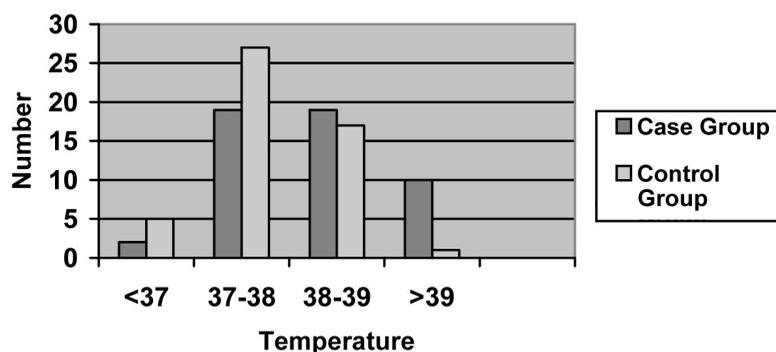
A hundred patients were studied, 50 patients with gastroenteritis and convulsion (the case group), matched for age, sex and date of visit (+/- 2 weeks) with 50 as the control group (with gastroenteritis but without convulsion). Biochemical studies including serum electrolytes, blood sugar and liver function tests were performed. Stool samples were collected and submitted for routine bacterial cultures on blood agar, MacConkey and Salmonella-Shigella (SS) agar plates. The details of characteristics documented included family history of febrile and afebrile seizures, temperature, electrolyte imbalances, and type of gastroenteritis (based on stool examination: inflammatory- more than 5 WBCs, and non-inflammatory- less than 5 WBCs; stool culture: shigella, no growth). Informed consent forms were signed by the parents of children studied. All data were collected according to specific checklists. First the data was categorized, and the frequency of each of the variables was determined; the variables and findings were then evaluated for each patient. The statistical significance of associations was determined by McNemar . For calculations, the SPSS 11.0 was used.

Factors independently predictive of a documented seizure were determined using a multiple logistic regression analysis.

### Results

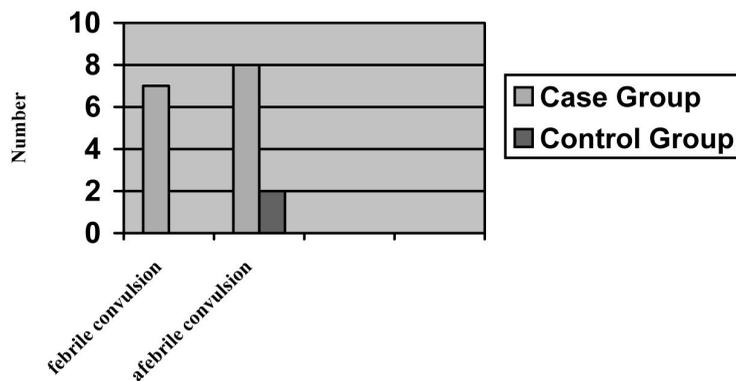
Between March 2004 and February 2005, 50 children, 28 (56%) males and 22 females (44%), aged 8 to 96 months (median 36months) were admitted to hospital for gastroenteritis in association with seizure. All had normal development milestones. 42% of patients had fever and 36% of the controls had fever. Figure 1 shows temperature differences in case and control group. Familial history of convulsion with or without fever is shown in figure 2.

Fig1: Temperatures in Case and Control groups



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Fig 2: Family history of febrile and afebrile convulsion in case and control groups



A marked seasonal distribution was seen among cases admitted between the months of July and October. Seizure occurred either the same day or preceded it by a median of 1 day as the diarrhea in 5(10%) children, all of patients had generalized convulsion. The number of seizures per child ranged from 1 to 3, with 6% having more than 1 episode. Most convulsions were short with 80% of children having seizures less than 5-minute durations; the longest seizures ranged between 5-15 minutes and occurred in 5(10%) children. History of convulsion with fever was positive in 2 cases, whereas none of the patients in either the case or control group had history of previous afebrile convulsions. Six cases (12%) had clinical signs of over 5% dehydration at presentation, whereas this

figure was 18(36%) in control group. All of children had normal serum urea, creatinine, glucose, calcium and magnesium levels. Electrolyte imbalances were seen in 6 cases (12%), all showing hyponatremia ranging from 125 to 130 meq/lit; in the control group 4 patients (8%) had electrolyte imbalances, 3 of whom had hyponatremia ranging between 125 and 130 meq/lit, while one had hypokalemia. Other abnormalities like hypocalcemia were not seen. The stools of all children were tested for pathogenic bacteria and while no salmonella, or campylobacter were found, 11 showed shigella; in the positive shigella cultures indicated inflammatory gastroenteritis. Table 1 shows culture results found in patients.

Table 1: Results of stool exam and culture results in the case and control groups.

	Stool exam		Stool culture	
	Inflammatory	Non inflammatory	Shigella	No organism
Case	31 (62%)	19 (38%)	11(22%)	39(78%)
Control	21(42%)	29(58%)	2(4%)	48(96%)

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The role played by temperature/fever in the occurrence of convulsion was also investigated, and a positive association between fever and convulsion was found (Odd ratio=2.41, P value= 0.008).

There was no association between history of previous febrile and afebrile convulsions of children and the incidence of convulsion ( $p < 0.05$ ). Although we found having a family history of febrile convulsions to be significantly associated with convulsions. No significant relation was found between electrolyte imbalance and the occurrence of convulsion (P value of 0.72, OR 1.7). Again we did not find any significant association between

the type of gastroenteritis (inflammatory or non-inflammatory) and convulsions (P value of 0.07, OR= 2.25)

A significant relation between positive Shigellosis and occurrence of convulsion in gastroenteritis was detected (P value of 0.01, and OR= 7.7).

There was an inverse association between the extent of dehydration and seizures (P 0.03, OR=3.8). On multivariable analysis, significant independent risk factors were dehydration (reverse relation), fever (P Value= 0.02) and shigellosis (P Value= 0.05).

**Table 2: Association between convulsion and different risk factors.**

Association of convulsion with	Odds ratio (Exact 95%CI of OR)	P-Value (Exact McNemar significance)
Hx of FC	0 (0-2.4)	0.25
Hx of C	0 (0-39)	1.0
Family Hx of FC	0 (0-0.7)	0.01
Family Hx of C	0.25(0.025-1.25)	0.11
Dehydration (1-2 vs. 3-4)	1.7(0.32-10.7)	0.72
Electrolyte imbalance	0.6 (0.09- 3.08)	0.72
Type of gastroenteritis	0.44 (0.16-1.07)	0.07
Shigella	10 (1.4-434)	0.01

FC:Febrile Convulsion ,Hx:History , C:Convulsion

### Discussion

In our study, a statistically significant association was found between high fever and convulsion. Other studies have also reported fever to be an important factor in convulsion occurrence in gastroenteritis, especially in shigellosis (3,4). Although we were unable to separate febrile convulsion from other seizure types in diarrheic patients, we can conclude that controlling temperature or fever can reduce the risk of convulsions during gastroenteritis. In other studies, researchers also report similar findings, recommending that fever reduction and metabolic alterations may help reduce these potentially lethal complications(3).

There were no association between history of febrile and

afebrile convulsion in children and convulsions during gastroenteritis ( $p < 0.05$ ). On multivariable analysis, significant independent risk factors for first febrile convulsion were high temperature, history of febrile seizures in first degree relative(5). It maybe possible that our results were due to simple febrile convulsions. Which may occur with any disease, and aren't always consequences of gastroenteritis.

Although electrolyte imbalance is a recognized etiology for convulsions during gastroenteritis, in this study, the comparison of the two groups demonstrated no statistically significant relation between electrolyte imbalances and the incidence of convulsion. This probably needs to be further investigated in larger numbers of patients.

Results of our study showed an inverse association between the amount of dehydration and occurrence of seizures, which may be due to the fact that the patients with seizure, higher temperature and poor condition required prompt hospitalization, and they received appropriate rehydration therapy.

In our study inflammatory gastroenteritis was found to have a borderline association with convulsions. A significant association between convulsion and positive stool culture for shigella in gastroenteritis was found, a finding that is in agreement with results of other studies(6,7,8). Limitations of our study were that we didn't use specific and selective media for bacteria like yersinia or campylobacter and stool cultures were done only for shigella and salmonella; we were hence unable to determine or confirm the viral causes of gastroenteritis. On the whole, this study statistically demonstrated a significant relation between high fever, a positive stool culture for shigella and the occurrence of convulsion in gastroenteritis; however no such significant relation was found between convulsion and electrolyte imbalances. Other paraclinical investigations like lumbar puncture are not necessary in patients with gastroenteritis and convulsion and should be done individually. In gastroenteritis with high fever and shigellosis, the risk of convulsions should be kept in mind.

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