

Association of Vitamin D Deficiency in Febrile SeizuresHarjot¹, Harshindar Kaur², Sukhmani Kaur³, Rajesh Ranjan⁴¹ Post Graduate Student, Department of Paediatrics, Rajindra Hospital, Patiala² Professor, Department of Paediatrics, Rajindra Hospital, Patiala³Medical Officer⁴Reader, Medical Care and Hospital Administration, National Institute of Health and Family Welfare, Munirka, New Delhi

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Abstract

Background: A febrile seizure is “an event in infancy or childhood, usually occurring between 3 months and 5 years of age, associated with fever but without evidence of intracranial infection or defined cause.”. Although the etiology of febrile seizures is multifactorial, there is increasingly raised concern that vitamin D deficiency might also play a causal role. The present study was conducted to establish the association of vitamin D deficiency in febrile seizures.

Materials & Methods: This prospective study (duration:1 year) was conducted on 120 patients in the department of paediatrics of GMC, Patiala. Informed consent was taken and then, patients were divided in two groups of 60 patients each- Case group included diagnosed cases of febrile seizures and control group included febrile patients without any seizures. The relevant biochemical tests of patients were done. The results were then analyzed.

Results: In the present study, the mean age in case and group were 28.60 ± 15.02 months and 29.75 ± 16.27 months, respectively (p-value 0.654). In both the groups, there was a male preponderance (case group- male 63.3%; control group- male 53.3%; p-value 0.266). Malnourishment was observed in 16.7% patients of case group and 20.0% patients of control group (p-value 0.637). In case vs control groups, various lab investigations were- Serum Vitamin D [23.99 ± 14.34 ng/ml vs 30.55 ± 14.60 ng/ml;p-value 0.014 (S)]; Serum calcium [6.55 ± 0.64 mg/dl vs 8.78 ± 0.97 mg/dl;p-value <0.0001 (S)]; Hemoglobin [9.67 ± 0.60 g/dl vs 9.80 ± 0.65 g/dl;p-value 0.257 (NS)]; Serum phosphorous [5.30 ± 0.67 mg/dl vs 5.35 ± 0.64 mg/dl;p-value 0.676 (NS)].

Conclusion: Vitamin D deficiency can be a risk factor for febrile seizures in children. Significantly lower level of vitamin D was observed in febrile seizure group. Vitamin D supplementation should be considered for epileptic children and children with epilepsy should follow a well-balanced diet and good nutritional habits to optimize seizure control along with proper control of seizures and a proper follow up.

Keywords: Febrile seizures, Vitamin D deficiency, Vitamin D insufficiency, Pediatric seizures, Epilepsy.

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Introduction

A febrile seizure is “an event in infancy or childhood, usually occurring between 3 months and 5 years of age, associated with fever but without evidence of intracranial infection or defined cause.”

This definition does not include seizures with fever in children who have had a prior afebrile seizure.[1]Epidemiological studies have estimated that 2%–5% of children under 5 years of age are affected by febrile seizures.[2]

The etiology of febrile seizures is multifactorial. The commonly recognized risk factors are viral illnesses, certain vaccines, genetic predisposition, etc.[3] There is a raised concern that vitamin D deficiency might play a causal role.[4]Vitamin D deficiency is as the most common nutritional deficiency.[5]In India, vitamin D insufficiency

ranges from 50–90% according to the age and regions.[6] The present study was conducted to establish the association of vitamin D deficiency in febrile seizures.

Materials and Methods

This prospective study was conducted on 120 patients in the Department of Pediatrics, Government Medical College & Rajindra Hospital, Patiala (Punjab) for a period of 1 year. The study protocol was approved by the institutional ethics committee and the patients were enrolled in the study after written informed consent from first degree relatives of patients.

Inclusion Criteria

- Patients who fulfilled the definition of febrile seizures.
- Subjects of age 6 months to 60 months.
- Patients admitted with signs of Vitamin D deficiency without seizures.

Exclusion Criteria

- Patients with history of epilepsy, or drug withdrawal seizures, or are known cases of hemolytic anemia.
- Children with hepatic, renal, or other metabolic problems.

The patients were randomized to two groups of 60 each-Case group included diagnosed cases of febrile seizures; and Control group included febrile patients without any seizures. After inclusion in the study, the serum vitamin D levels were analyzed by solid phase ELISA technique following the standard techniques and protocol. The results of observations of individual groups were pooled and analyzed using SPSS software version 25.0 Armonk, New York, USA.

Results

Baseline Characteristics

In the present study, the mean age of patients in case and group were 28.60 ± 15.02 months and 29.75 ± 16.27 months, respectively (p-value 0.654).

In both the groups, there was a male preponderance (case group- male 63.3% vs female 36.7%; control group- male 53.3% vs female 46.7%; p-value 0.266). According of socio-economic status, majority of the patients belonged to Upper lower class (case group 30.0% vs control group 38.3%; p-value 0.759). Malnourishment was observed in 16.7% patients of case group and 20.0% patients of control group (p-value 0.637). Family history of seizures was present in 13.3% patients of case group and 1.7% patients of control group (p-value 0.015). Mean body temperature was $101.67 (\pm 1.24)$ F and $101.49 (\pm 1.18)$ F in case and control group respectively (p-value 0.417). In case group, majority of the patients (53.3%) had seizures for less than 5 minutes, followed by 6-10 minutes in 36.7% patients and more than 10 minutes in 10% patients. [Table 1 and Figure 1]

Mean Laboratory Findings

Serum Vitamin D was 23.99 ± 14.34 ng/ml in case group and 30.55 ± 14.60 ng/ml in control group [p-value 0.014 (S)]. Serum calcium was 6.55 ± 0.64 mg/dl in case group and 8.78 ± 0.97 mg/dl in control group [p-value <0.0001 (S)]. Hemoglobin was 9.67 ± 0.60 g/dl in case group and 9.80 ± 0.65 g/dl in control group [p-value 0.257 (NS)]. Serum phosphorous was 5.30 ± 0.67 mg/dl and 5.35 ± 0.64 mg/dl in case and control group respectively [p-value 0.676 (NS)]. [Table 2].

Table 1: Baseline data of patients

Parameters	Variables	Case group	Control group	p-value
Mean age (months)		28.60 ± 15.02	29.75 ± 16.27	0.654 (NS)
Gender distribution	Male	63.3%	53.3%	0.266 (NS)
	Female	36.7%	46.7%	
Socio-economic status	Upper class	3.3%	1.7%	0.759 (NS)
	Upper middle	13.3%	16.7%	
	Lower middle	26.7%	20.0%	
	Upper lower	30.0%	38.3%	
	Lower	26.7%	23.3%	
Nutritional status	Normal	83.3%	80.0%	0.637 (NS)
	Malnourished	16.7%	20.0%	
Family history of seizures		13.3%	1.7%	0.015 (S)
Mean temperature (F)		101.67 ± 1.24	101.49 ± 1.18	0.417 (NS)

Table 2: Mean laboratory parameters findings

Parameters	Case group	Control group	p-value
Serum Vitamin D (ng/ml)	23.99 ± 14.34	30.55 ± 14.60	0.014 (S)
Hemoglobin (g/dl)	9.67 ± 0.60	9.80 ± 0.65	0.257 (NS)
Serum calcium (mg/dl)	6.55 ± 0.64	8.78 ± 0.97	<0.0001 (S)
Serum phosphorous (mg/dl)	5.30 ± 0.67	5.35 ± 0.64	0.676 (NS)

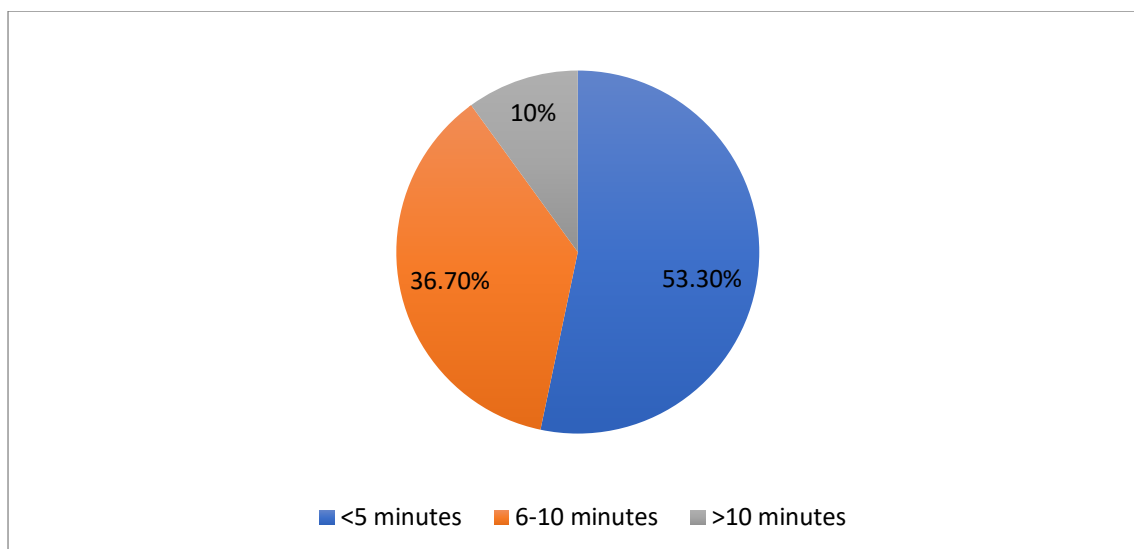


Figure 1: Duration of seizures in case group

Discussion

Baseline Characteristics of Patients

The mean age of patients in case and control group were 28.60 ± 15.02 months and 29.75 ± 16.27 months, respectively. In both the groups, there was a male preponderance (case group- male 63.3%; control group- male 53.3%). Singh V et al (2019) reported that mean age of patients in case group and control groups were 29.6 ± 14.3 months and 29.7 ± 14.2 months, respectively. Males (64.9%) was more in number than females (35.1%). [7] Abbasi E (2012) had the mean age of patients in case group and control groups were 31.5 ± 6.4 months and 32.1 ± 16.2 months, respectively. [8]

Laboratory findings

The serum vitamin D was 23.99 ± 14.34 ng/ml in case group and 30.55 ± 14.60 ng/ml in control group [p-value 0.014 (S)]. Serum calcium was 6.55 ± 0.64 mg/dl in case group and 8.78 ± 0.97 mg/dl in control group [p-value <0.0001 (S)]. Hemoglobin was 9.67 ± 0.60 g/dl in case group and 9.80 ± 0.65 g/dl in control group [p-value 0.257 (NS)]. Serum phosphorous was 5.30 ± 0.67 mg/dl and 5.35 ± 0.64 mg/dl in case and control group respectively [p-value 0.676 (NS)]. Abbasi E (2012) reported that the mean vitamin D in patients with febrile seizure was 26.18 ± 12.44 ng/ml, and in febrile patients without seizures was 30.83 ± 28.93 ng/ml (p-value 0.30). [8] However, Heydarian F (2020) reported that the mean serum level of vitamin D in the with and without seizure groups was 41.92 ± 22.42 and 48.41 ± 15.25 mg/dl, respectively (p = 0.08). The serum phosphorus level was 4.09 ± 0.74 and 4.59 ± 0.71 mg/dL in patients with and without seizure, respectively (p = 0.058). [9] Hassan MA (2022) found no significant difference in the levels of vitamin D levels between

both groups (22.12 ± 21.97 vs 29.28 ± 14.83 ng/ml, P = 0.170, for convulsive and non-convulsive patients, respectively). [10] The anticonvulsant nature of vitamin D was first reported in the year 1974. [11] Vitamin D can act as a neurotransmitter and may also enhance the effect of other neuroprotectin agents. Studies have suggested that febrile disease may have some underlying some metabolic changes. [12]

Conclusion

The present study found that vitamin D deficiency can be a risk factor for febrile seizures in children below 5 years of age. Significantly lower level of vitamin D in febrile seizure group was noticed.

Vitamin D supplementation should be considered for epileptic children and children with epilepsy should follow a well-balanced diet and good nutritional habits to optimize seizure control along with proper control of seizures and a proper follow up of complex febrile seizures.

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