

Status of serum calcium level in febrile children with and without seizure

¹Dr. Vishnu Agarwal, Associate Professor, Department of Pediatrics, J K Lon Hospital, SMS Medical College & Hospital, Jaipur

²Dr. Swati Mehta, Senior Resident, Department of Pediatrics, J K Lon Hospital, Jaipur, SMS Medical College & Hospital, Jaipur

³Dr. Neha Agarwal, Associate Professor, Department of Pediatrics, J K Lon Hospital, Jaipur, SMS Medical College & Hospital, Jaipur

⁴Dr. Lovisha Arora, Junior Resident, Department of Pediatrics, J K Lon Hospital, Jaipur, SMS Medical College & Hospital, Jaipur

⁵Dr. Mukesh Solanki, Resident, Department of Pediatrics, J K Lon Hospital, Jaipur, SMS Medical College & Hospital, Jaipur

Corresponding Author: Dr. Mukesh Solanki, Resident, Department of Pediatrics, J K Lon Hospital, Jaipur, SMS Medical College & Hospital, Jaipur

Citation this Article: Dr. Vishnu Agarwal, Dr. Swati Mehta, Dr. Neha Agarwal, Dr. Lovisha Arora, Dr. Mukesh Solanki, “Status of serum calcium level in febrile children with and without seizure”, IJMSIR- April - 2021, Vol – 6, Issue - 2, P. No. 64 – 67.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: To study the serum calcium status in children aged 6 months to 5 years with first episode of febrile seizure and to find the association between vitamin D3 levels and febrile seizure.

Methods: We conducted the comparative observational study in Department of Pediatrics, SPMCHI, S.M.S. Medical College, Jaipur, from June 2019 to July 2020. 60 children within the age group of 6 months to 5 years each under case and control groups were included.

Results: Mean calcium level in deficient group was 9.14 ± 0.72 mg/dl, in insufficient group was 9.20 ± 0.71 mg/dl and in normal patients was 9.30 ± 0.71 mg/dl. However the difference is not statistically significant.

Conclusion: Insignificant association was found between serum calcium levels and the occurrence of febrile seizures. The calcium levels were not in the hypocalcemic range.

Keywords: Calcium, Febrile, Seizure.

Introduction

Febrile convulsions (FC) are seizures occurring in a neurologically healthy child. 2-4% of children experience a FC during the first 6 years of life ¹ and approximately 1/3 will have recurrent episodes. Therefore, recognition of predisposing factors seems important to prevent of a repeated attack.² Studies have shown different (often inconclusive) results for an association between reduced serum

electrolytes (including low serum Calcium) and Seizures. Excitatory post synaptic transmissions that occur with very low calcium state lead to uncontrolled epileptiform discharges. In the brain, hundreds of intracellular processes are known to depend on calcium influx.³ Hence this study was conducted with an objective to study the association between serum calcium and febrile seizures

Material and Methods

Place of Study

Department of Paediatrics, S.P.M.C.H.I and attached group of hospitals, S.M.S. Medical College Jaipur, (Rajasthan).

Type of Study

Hospital based comparative observational study

Study Period

June 2019 to July 2020 or till completion of sample size after approval from ethical committee.

Inclusion Criteria

Case

- Children of age group 6 months to 5 years presenting with first episode of simple febrile seizure.

Control

- Case selected with similar age groups and same sex presented with short duration of fever of at least 2 days but without seizure.

Exclusion Criteria

Children presenting with

- atypical febrile seizures
- afebrile seizures,
- any signs of CNS infections,
- sick children, those with neurodevelopmental delay,
- previous history of febrile seizures
- liver, renal or endocrinal disorders .
- refusal for consent

Statistical analysis

- The Fischer's exact test (two-tailed), Chi-square test and Z score were performed to analyse differences in proportions of categorical variables between two groups.
- The level $p < 0.05$ was considered as the cut-off value for significance.
- All analyses were performed using IBM SPSS statistics. Version20, for Windows.

Observation

Table 1: Distribution of cases according to age

| | Cases | | Controls | |
|-------------|-------|--------|----------|--------|
| | No. | % | No. | % |
| 6-24 month | 51 | 85.00 | 39 | 65.00 |
| 25-43 month | 9 | 15.00 | 10 | 16.67 |
| 44-60 month | 0 | 0.00 | 11 | 18.33 |
| Total | 60 | 100.00 | 60 | 100.00 |

The above table depicts that maximum number of patients in case group (85.00%) and controls group (65.00%) lies in the age group of 6-24 months.

Table 2: Distribution of cases and controls according to gender

| | Cases | | Controls | |
|--------|-------|--------|----------|--------|
| | No. | % | No. | % |
| Male | 43 | 71.67 | 40 | 66.67 |
| Female | 17 | 28.33 | 20 | 33.33 |
| Total | 60 | 100.00 | 60 | 100.00 |

Above table depicts that males were more in number 43(71.67%) as compared to females 17 (28.33%) in cases group and males were more in number 40(66.67%) as compared to females 20 (33.33%) in controls group.

Table 3: Distribution of cases and controls according to serum calcium levels

| | Calcium | | |
|----------------------------|--------------|-------|------|
| | Cases (n=60) | Mean | SD |
| Deficient (<12 ng/ml) | 9 | 9.14 | 0.72 |
| Insufficient (12-20 ng/ml) | 34 | 9.20 | 0.71 |
| Normal (\geq 20 ng/ml) | 17 | 9.30 | 0.72 |
| p value | | 0.843 | |

Above table depicts that mean calcium level in deficient group was 9.14 ± 0.72 mg/dl, in insufficient group was 9.20 ± 0.71 mg/dl and in normal patients was 9.30 ± 0.71 mg/dl. However the difference is not statistically significant

Table 4: Distribution of cases and controls according to serum phosphorus levels

| | Phosphorus | | |
|----------------------------|-------------|-------|------|
| | Cases(n=60) | Mean | SD |
| Deficient (<12 ng/ml) | 9 | 4.37 | 0.86 |
| Insufficient (12-20 ng/ml) | 34 | 3.96 | 0.81 |
| Normal (\geq 20 ng/ml) | 17 | 4.48 | 0.68 |
| p value | | 0.065 | |

Above table depicts that mean phosphorus level in deficient group was 4.37 ± 0.86 mg/dl, in insufficient group was 3.96 ± 0.81 mg/dl and in normal patients was 4.48 ± 0.68 mg/d. However the difference is not statistically significant.

Table 5: Distribution of cases and controls according to alkaline phosphatase levels

| | ALP | | |
|----------------------------|--------------|--------|-------|
| | Cases (n=60) | Mean | SD |
| Deficient (<12 ng/ml) | 9 | 159.11 | 28.05 |
| Insufficient (12-20 ng/ml) | 34 | 161.71 | 45.53 |
| Normal (\geq 20 ng/ml) | 17 | 151.12 | 36.74 |
| p value | | 0.686 | |

Above table depicts that mean Alkaline phosphatase levels in deficient group was 159.11 ± 28.05 IU/L, in insufficient group was 161.71 ± 45.53 IU/L and in normal patients was 151.12 ± 36.74 IU/L. However the difference is not statistically significant

Discussion

The study was conducted in the Department of pediatrics, S.P.M.C.H.I and attached group of hospitals, SMS Medical College, Jaipur, from June 2019 to July 2020.

In our study mean calcium level in deficient group was 9.14 ± 0.72 mg/dl, in insufficient group was 9.20 ± 0.71 mg/dl and in normal patients was 9.30 ± 0.71 mg/dl. However the difference is not statistically significant

Similar to our study there was no association between low Serum calcium and FS in studies by N. Rutter et al, Sakha k et al and Sayedzadeh S A et al.⁴⁻⁶ Reduced serum Calcium causes increased neuroexcitability. Low ionized Calcium levels in the extra cellular fluid, by binding to the exterior surface of the Sodium channel protein molecule in the plasma membrane of nerve cells, increasing the permeability of neuronal membranes to sodium ions, causing a progressive depolarization thus increases the possibility of action

potentials. When Calcium ions are absent, the voltage level required to open voltage gated Sodium channels is significantly altered (less excitation is required). With hypocalcemia, action potentials may be spontaneously generated causing contraction of peripheral skeletal muscles resulting in clinical seizures.⁷

Conclusion

Insignificant association was found between serum calcium levels and the occurrence of febrile seizures. The calcium levels were not in the hypocalcemic range. In future, studies with large sample size are needed to confirm the definitive role of serum calcium in febrile convulsions especially in developing countries like India.

References

1. Vestergaard M, Obel C, Henriksen TB, Christensen J, Madsen KM, Ostergaard JR, et al. The Danish National Hospital Register is a valuable study base for epidemiologic research in febrile seizures. *J Clin Epidemiol.* 2006;59:61-6.
2. Mohammed A. Mikati. Seizures in Childhood. Behrman RE, Kleigman RM, editors, Nelson Textbook of Pediatrics 19th edition Philadelphia: Saunders. 2011;586:2013-18.
3. Veena Kalra. Febrile Convulsions. In: Ghai OP, Gupta P, Paul VK, editors. Ghai Essential Pediatrics. 7th ed. New Delhi: CBS Publishers and Distributors; 2004:528
4. Rutter N. and Smales ORC. Calcium, magnesium, and glucose levels in blood of children with febrile convulsions. *Archives Dis Childhood.* 1976;51:141.
5. Sakha K, Barzar M. Evaluation of Serum Sodium and Ionized Calcium Levels in Febrile Convulsions. *Pediatr Med Chir.* 1985;7(2):249-52.
6. Sayedzadeh SA, Hemati M. Serums Sodium and Calcium Level in Children with Simple and Recurrent Febrile Convulsion. *J Comprehens Pediatr.* 2013;3(5):179-83
7. John E, Guyton, Hall. Text book of medical physiology. 13th ed. Philadelphia: Saunders/ Elsevier; 2010:116