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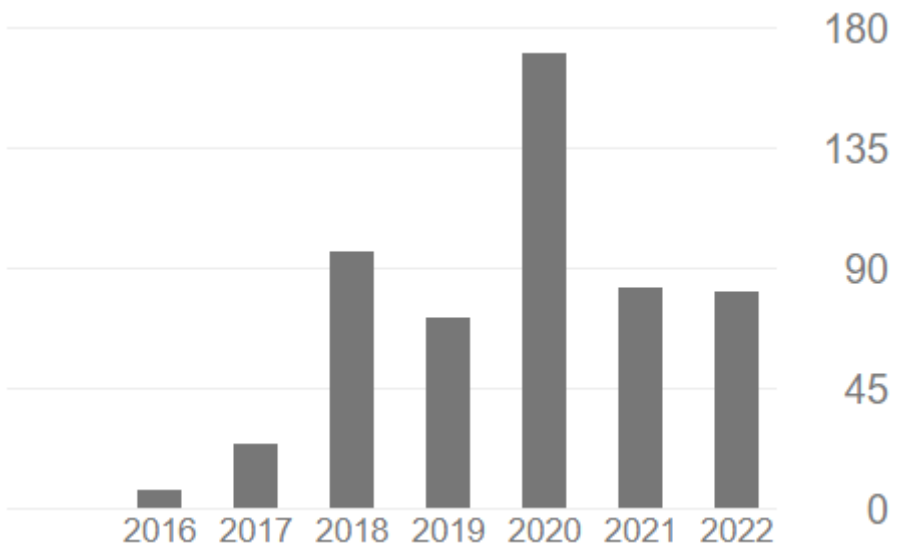

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Hypocalcemic seizure caused by vitamin D deficiency in infant

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***Abstract*---**We described the case of a 2-month-old child was presented to the emergency department with a generalized seizure, which started 40 days after birth. The laboratory examination revealed hypocalcemia (3.4 mg/dL), normal albumin serum, elevated PTH level of 235.9 pg/mL, decreased vitamin D of 13.8 ng/dL, and normal renal function. The mother had not consumed vitamin D supplement during pregnancy and lactation. The patient had also been consuming phenobarbital since the age of 1 month due to a previous history of seizures. The disease was managed with oral administration of 10% calcium gluconate along with 5000 IU of vitamin D3 daily to manage calcium homeostasis. The treatment stabilized the patient's condition and there was rapid improvement in laboratory findings. After 6 months, the seizure disappeared and the level of vitamin D (25-hydroxy vitamin D) was normal, namely 80 ng/dL.

***Keywords*---**vitamin D deficiency, hypocalcemia, seizure.

Introduction

Seizures are commonly observed in the children and have a prevalence rate of 4-7% among infants and children.[3] Furthermore, hypocalcemia is one of the most common biochemical problems of this condition amongst other etiologies in developing countries. It is caused by vitamin D deficiency, which is the main factor contributing to the prevalence of infantile seizures.[7] It was assumed that the deficiency and rickets have been eradicated after the discovery that vitamin D is synthesized during exposure of the sun and some common foods fortification, but they are now becoming a major global health issue.[3]

Hypocalcemia is one of the electrolyte disturbances that can induce seizures. A stable extracellular ionized calcium concentration is required for optimal brain cell function and is maintained via a homeostatic mechanism that includes vitamin D and parathyroid hormone (PTH). In addition, vitamin D deficiency must be examined in the differential diagnosis when hypocalcemia occurs for the first time throughout infancy without a history of neonatal seizures.[1]

Case Report

A 2 months-old male infant was reffered to the emergency department of Soetomo Hospital with a complaint of recurrent generalized seizures. The patient was alert and had no history of fever, vomiting, cough, and diarrhea. The baby was born healthy at preterm 33 weeks and had been exclusively breast fed since birth. There was also no history of childhood seizures in the family. The mother was fit, aged 31 years with one older child, but the first child died suddenly 8 months after birth. There was also no history of vitamin or nutritional supplement intake during pregnancy and lactation.

The neurology examination showed no specific neurological finding in terms of mental status, Glasgow Coma Score, and state (alert, disoriented/awake, stuporous, coma/decorticate, or coma/decerebrate). There were no cranial nerves abnormalities such as ptosis, ophthalmoplegia, or facial paralysis, and the deep tendon reflexes as well as motor hemiparesis were normal. On admission, the patient was diagnosed with hypocalcemia, increased alkaline phosphatase and parathyroid hormone level as well as low vitamin D (25 OH-vitamin D) level of 13.8 ng/mL (Table1). Thewrist X-rays revealed the existence of rickets despite the absence of clinical signs. The electroencephalography and head CT scan were normal. Management for the patient was carried out with anticonvulsant, 10% calcium gluconate intravenous injection, and 5000 IU of vitamin D3 daily.

Table 1. The Laboratorium results of the patient

Parameters	Results	Reference Value
25 hydroxy-vitamin D	13.8 ng/mL	30-100 ng/mL
Calcium	3.4 mg/dL	8.8-11.3 mg/dL
Alkaline phosphatase	373 mg/dL	15-31.6 pg/mL
Parathyroid hormone	235.9 pg/mL	5.7-34 pg/mL

Discussion

A seizure, also known as a convulsion, is a paroxysmal, time-limited change in motor activity or behavior induced by aberrant electrical activity in the brain.[5] It is also highly frequent in children, with a prevalence rate of 4% - 7%.[1] Furthermore, its presence is not used to make a diagnosis; rather, it is a symptom of an underlying central nervous system problem caused by systemic or metabolic disorders.[2]

The patient in this study came to the emergency department with a complaint of seizures. Apart from being the cardinal manifestation of epilepsy, the complaint can also be caused by various transient disorders that lead to neuronal excitation, such as fever, disturbances of electrolyte, as well as infection of central nervous system including encephalitis or meningitis, ischemia, bleeding, and head trauma.[4] This case report presents a patient with late hypocalcemia, which is a frequent metabolic problem during the newborn and infancy. Calcium plays a role in a variety of biochemical processes in the body, intracellular signal transduction, including blood coagulation, neural transmission, muscular functions, cellular membrane integrity and function, cellular enzymatic activities, cell differentiation, and bone mineralization.[9] A total serum calcium level of 8 mg/dL (2 mmol/L) or ionized calcium level of 4.4 mg/dL (1.1 mmol/L) indicates hypocalcemia. Apnea, cyanosis, poor feeding, vomiting, tachycardia, heart failure, prolonged QT interval, irritability, tremor, laryngospasm, tetany, hyperacusia, jerking, twitching episodes, and focal and generalized seizures are the most common clinical symptoms. [9]

The late-onset, which is typically symptomatic, begins after 72 hours and lasts till the end of the first week after birth. Excessive phosphate consumption, hypomagnesemia, hypoparathyroidism, and vitamin D deficiency are the most common causes. In addition, the causes of vitamin D deficiency in infants are maternal deficiency, malabsorption, renal failure, and hepatobiliary disorders.[9]

Since birth, this patient had only received breastfeeding. A high risk of vitamin D deficiency exists among pregnant women, breastfeeding infants, the elderly, people living at high latitudes with dark skin, those who wear burkas, and those who practice strict sun avoidance.[10] In this instance, the mother had not used any nutritional or vitamin supplements throughout pregnancy or breastfeeding. According to a recent study, vitamin D deficiency in children is caused by low maternal levels and is the second most important contributor to hypocalcemia, as indicated by an undetectable 25-hydroxyvitamin D level.[2]

In this case, hypocalcemia was treated with oral calcium, intravenous calcium injection, and vitamin D therapy. The primary goal of this treatment is to restore normal serum calcium and phosphorus levels. Regardless of serum level, treatment with active vitamin D analogs should be explored when PTH is greater than twice the upper normal range. Depending on the patient's calcium intake from food, calcium supplements may also be considered throughout treatment. All patients must maintain normal 25-OH vitamin D levels with appropriate supplementation. In addition, 400 IU/d (10 g) of supplements for the prevention

of rickets and osteomalacia are suggested for all infants ages 0 to 12 months, regardless of feeding technique.[6]

Conclusion

Generalized seizure in an afebrile newborn implies a major and etiopathogenically heterogeneous condition, according to the data. In rare instances, vitamin D deficiency can also cause seizures; therefore, its levels in hypocalcemic patients must be monitored.

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