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Measuring Levels of Some Vitamins in the Blood Serum of Children with Epilepsy

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Abstract

Background: Epilepsy is one of the most common debilitating neurological conditions among children in the world. vitamin D3, vitamin B12 and Folic acid levels are altered in patients with epilepsy, which may increase the likelihood of a seizure. Objective: To investigate the difference in serum vitamin D3, vitamin B12 and Folic acid (vitamin B9) levels between the control group and the patient group. Methods: Case-control study on 121 epileptic patients, aged from 2 months to 15 years, from the visitors of consult clinic in Babil hospital for maternity and childrenand Outpatient pediatricians clinics in AL-Hillah city and 58 healthy children with same age and sex. Venous blood withdrawn from patients and controls then serum levels of vitamin D3, vitamin B12, and Folic acid were measured, using ELIZA kits specific for each type of vitamins.Results:After obtaining the results of the ELASA test for each vitamin and a comparison between the group of epileptic children and the group of control, we found in this study the following: 1)vitamin D3 showed higher significant differences in patients than controls(*P≤0.05)*;2) there was no significant differences between the two groups for vitamin B12 (*P≤0.05)* ,and 3)there was lower sig. difference of patients group than control group(*P≤0.05)*.
Keywords:Epilepsy, Children, Vitamin D3, Vitamin B12, Folic acid.

Introduction

One of the most prevalent neurological conditions is epilepsy, which affects individuals of all genders, races, social backgrounds, and geographical locations. Epilepsy is a neurological disorder marked by a predisposition to seizures and the neuro-biological, physical, psychological, and social consequences of seizure recurrences. [1]A global health issue affecting allage classes is vitamin D (vitD) deficiency. In preserving bone integrity, immune function, muscle strength, neuro-transmission in the central nervous system in children without epilepsy, VitD plays a vital rule[2, 3] Although low vitD levels tend to increase seizure frequency in children with epilepsy. Significant seasonal variation in seizure frequency has been reported in large epidemiological studies, with incidence or occurrence of seizures is higher in winter than in summer [4]. The low vitD level was attributed to the increased seizure frequency during winter[5].Vitamin B12 deficiency in children has been recognized to cause serious neurological, gastro-intestinal and hematological sequelae since the first study in 1962.Neurological effects are consistent with vitamin B12 deficiency. Epileptic seizures, hypotonia and developmental delay are typical clinical disorders associated with B12 deficiency[6, 7]In synaptic myelination, synaptogenesis, and neurotransmitter production, folic acid and vitamin B-12 are used with findings showing a clear correlation between their deficits and cognitive impairments [8]. Many cytochrome P450 (CYP) and glucoronyltransferase (GT) enzymes in the liver and, thus, folate and vitamin B12 synthesis are induced by extended use of AEDs [9]. There are controversial studies of insufficient evidence on the relationship between their serum level and comprehension in children with epilepsy including folic acid and vitamin B12 status in children with epilepsy. [10, 11]

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Materials and Methods

Samples collection

Samples were collected during the period 12/2/2020 – 30/12/2020 , from the visitors of consult clinic in Babil hospital for maternity and children and Outpatient pediatricians clinics in AL-Hillah city, A written Agreement was signed by every participants' parents after their understanding of the project aim and tests that would be performed. we collected 181 samples, 121 from children undergo epilepsy and 58 sample of healthy children ,their age between 2months to 15 years for both groups .Three milliliters of venous blood was obtained by 5ml disposable syringe (without tourniquet) , drained into a plain gel tube for the processing of serum, which will be used in biochemical experiments over the next 6 hours.

Vitamin D3

Vitamin D3 was measured in the blood serum using the (Human vitamin D3 ELISA kit)from Bioassay Technology laboratory , Cat.No.E1546Hu .

Vitamin B12

Vitamin B12 was measured in the blood serum using the (Human vitamin B12 ELISA kit)from Bioassay Technology laboratory , Cat.No.E1544Hu .

Folic acid

Folic Acid was measured in the blood serum using the (Human Folic Acid ELISA kit)from Bioassay Technology laboratory , Cat.No.E1509Hu.

Statistical analysis

All statistical analyses were carried out using SPSS (IBM Corp. Published 2012) software. Version 21.0 of IBM SPSS Statistics for Windows. Armonk, NY: IBM Corp. USA) and Microsoft Excel (2010, Microsoft Corp. USA). The outcomes were all expressed as mean ± SEM. Statistically important was deemed a $p < 0.05$.. To determine the existence of significant differences, the Unpaired-Sample T Test was used. Analyzing regression to determine the existence of associations. Chi-square test to compare variables of categorical association and genetic association, according to (sole *et al*.,2006)[12].

Results

Our study included 121 children with epilepsy between the ages of two months and 15 years, and the control group included 57 children within the same age group.There is a comparison of age, gender, serum level of vitamin D3, serum level of vitamin B12 and serum folic acid between the patient and control groups table(1).Mean of serum vitamin D3 level was significantly lower in control than in patients group (28.53±1.57 , 42.68±3.53 , $P \leq 0.05$; Respectively) . There was no significant difference between patients and control groups for vitamin B12 level in serum ; and finally in our study the mean of serum folic acid was significantly higher in control than patients group (15.2±0.81 , 5.34±0.49, Respectively ; $P \leq 0.05$). (figure 1).

Table 1. Clarify the number and gender of samples.

	Case	**Control**	***P.* value**
Age (mean)	3.83±0.33	3.61±0.45	0.69

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Gender (%)	Female	38%	40.6%	
	Male	62%	59.4%	

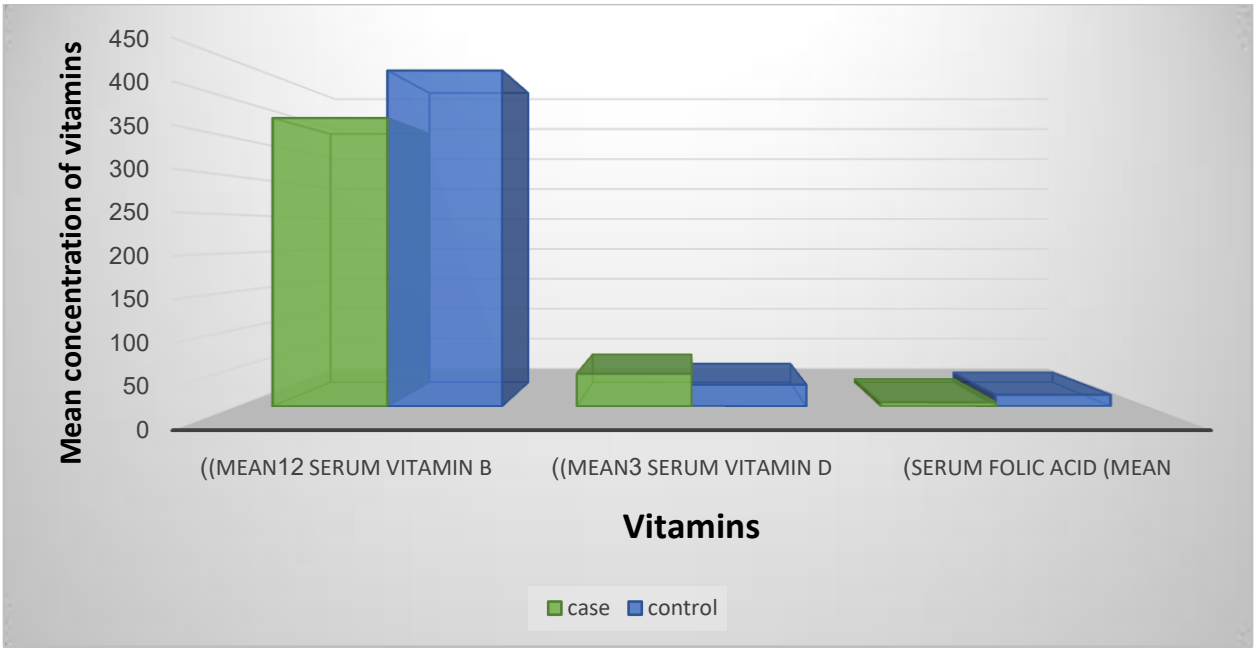

Figure 1. Comparison of different variables between control and patients groups.

Discussion

The pediatrics with epilepsy showed significantly higher level of vitamin D3 than control,Yazdi has shown that vitamin D administration can substantially raise the threshold for seizures, decrease the threshold for seizures, and severity of chemically triggered seizures and rise of phenytoin and valproate anticonvulsant effect[13]. Despite this, many researchers found that epilepsy patients suffer from lower levels of serum vitamin D3 compared to healthy children such as Fong in South Queensland hospital found a high level of vitamin D deficiency and insufficiency population of children on long-term antiepileptic drugs[14]; Elmazny 2019 in their study of Egyptian children with epilepsy found serum vitamin D level was significantly lower in patients compared with controls (P-value <0.001)[15] and in Saket et al 2021 study showed lower serum Vit D in the antiepileptic drug users, especially among children who took stimulant antiepileptics, The rates of Vit D deficiency and insufficiency were 10% and 38.3%[16].There was no significant difference between patients and control groups for vitamin B12 level in serum, while Sharma and his group found highly significant decrease in vitamin B12 [17].HUANGNoticed that epileptic pediatrics suffer from significantly decrease in serum B12 level after have antiepileptic drugs [9]. The mean serum vitamin B12 level was significantly lower in children with infantile spasms as compared to the controls[18].The mean of serum folic acid was significantly lower in patient than control group (5.34±0.49, 15.2±0.81,Respectively ; $P \leq 0.05$), our result was very close to the results reached by Deopa and his group, as their study indicated that there was a significant difference as the mean of folic acid in the serum is lower among children with epilepsy compared with children in the control group (8.45 ± 2.97 ng/mlvs. 12.05 ± 4.33 ng/ml, $p \leq 0.05$) [19]. Prabowo and colleagues concluded thatusing antiepileptic drugs in the long time can increasing homocysteine serum and decreasing folic acid and calcium serum level [20].In the study conducted by Youness and his group, they clarified that no significant difference was detected between patients and the control group regarding the average level of folic acid in the blood, and the results obtained by the researchers were (9.45 ± 10.4 versus 8.6 ± 4.64, respectively).[11].

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Conclusions

The decreasing in folic acid was found in children with epilepsy. This may be due to an increase in folic acid metabolism as a result of taking antiepileptic drugs, while the level of vitamin D3 was the highest among children with epilepsy, and vitamin B12 did not show any significant differences between Children with epilepsy and healthy children within the community from which samples were drawn.

Limitations

One of the most important obstacles that faced this research is that the period for collecting samples was during the spread of the Corona virus and the disruption of work hours, in addition to parents' fear and opposition to drawing blood from their children, especially children under the age of one year.

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