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SERUM SEROTONIN AND VITAMIN D LEVELSIN BOYS WITH CONDUCT DISORDER VERSUS NORMAL BEHAVIOR FROM BAQUBA CITY

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SUMMARY

Backgrounds : Serotonin and vitamin D concentrations in children and adolescent are involved in behavior and social relationship through their role in central nervous system, thus recent studies in the world indicated that the steroid hormones and neurotransmitters linked and regulate the behavior by acting on the function and physiology of many systems in the human body.

Aim of the study: This work aimed to compare the neurotransmitter serotonin and 25(OH) vitamin D levels can altered among prosocailprimary school children and abnormal behavior conduct disorder for evaluation the role of these essential component in the abnormal behavior.

Subjects and methods: The study subjects consisted of 80 boys with age between 9-15 years old. Conduct behavior was diagnosed by Rutter Child Behaviour Questionnaire (RCBQ), blood sample was collected from the pupils in the two groups of the study between 8-10 Am under standardized condition. Serotonin and vitamin D analysis was performed by using indirect enzyme linked immuonosorbent(IELISA) assay, then data were statistically analyzed using SPSS.

Result: the results showed that mean serum serotonin level was lowered (2.053±0.58 ng/ml)in conduct pupils when compared to control group (2.89± 0.73 ng/ml) but didn't find significant differences in the mean of serum serotonin level between the two groups. Also the mean serum 25(OH) vitamin D was significantly decrease ($p<0.05$) in conduct group (18.38± 2.43 ng/ml) as compared to normal control pupils (20.57±3.29 ng/ml).there is highly significant correlation ($p<0.001$) among them, with the simple linear regression between 25(OH) vitamin D and serotonin, when 25(OH) vitamin D goes up the serotonin rises two.

Conclusion:the information about concentration of serotonin and vitamin D in serum of school aged children is not completely available or poor especially in Iraq. The deficiency of serotonin and vitamin D is occur as appear in this study, need further studies and attention should paid in primary school children to correct the nutrition deficiency that are included in development and behavioral regulation.

Keywords: Conduct Disorder, Serotonin, 25(OH)- Vitamin D, Primary School Children

Introduction

conduct disorder is consider one of psychiatric syndromes that occur in pre-adolescence and adolescence period, which increases the risk of many dangerous problems of public health, as the weapon use, substance abuse and dropping or escaping out of school (1).

Therefore the identification of this disorder it is important as early as possible. It has two subtypes: the first onset during the period, which if left untreated, has bad prognosis. The symptoms include, aggression, destruction of the property destruction and lack or bad peer relationships. And 40% of the type childhood onset of conduct disorder are develop into adult antisocial personality disorder. The second type is adolescent conduct disorder (2).

Boys are more diagnosed than girls by conduct disorder, may occur at the age between 5-6 years but many pass the threshold between the age 8 to 14. The prevalence of conduct disorder reach to 4% in 13–16 year olds, In addition, there is evidence that conduct disorder has an important co morbidity such as oppositional defiant disorder with attention deficit hyperactivity disorder with rate reach to 50% to 30% with depression, anxiety disorders and learning disabilities between 30 and 40% (3, 4).

The genetic and hormonal difference are the most possible causes, the monoamines as neurotransmitters in the central nervous system like norepinephrine, dopamine and serotonin

are the most widely studied in relationship to behavior of human specifically conduct and aggression, because of their role in the brain (5). The number of serotonin receptors are increased in the past years, reaching 14 different receptors and they are classified into seven families (5-HT1-7) according to their function, structure, and pharmacology or treatment (6,7), the number of research on the role of serotonin in the brain since the discover of this neurotransmitter are increased enormously (8).

5HT1 receptors are auto receptors and are negatively linked to adenylate cyclase.5HT1A is regulating firing rate because it is located on somas and dentrites of raphe nuclei, but release modifing 5HT1B receptor is located presynaptically such as substantia nigra. Also the serotonin 1 receptors are heteroreceptors, found in the axon terminals of non-serotonergic neurons, postsynaptic to the serotonin releasing neuron (9, 10).

Similarly, vitamin D is consider as one of the neuroactive hormones type steroid that have important role in the development of normal brain.Vitamin D receptors and 1α-hydroxylase enzyme, an enzyme responsible for the formation of the active form of vitamin D, arelocated throughout the central nervous system. Vitamin D receptors and enzymes are located in neuronal cells of the substantia nigra, hippocampus, hypothalamus, prefrontal cortex, and cingulated gyrus; many of these regions have also been shown to have abnormalities in ADHD [(11, 12)]. There is data to suggest that Vitamin D deficiency during development has deleterious effects on the dopamine system and, in animal models, vitamin D has been shown to be associated with the production of tyrosine hydroxylase, the rate-limiting enzyme for dopamine synthesis [(13,14)]. Vitamin D may exert its neurological effects through various mechanisms. In animal models, it has been shown that vitamin D is an important factor for the differentiation of developing brain cells, is involved in axonal growth, can increase antioxidants such as glutathione and therefore protect against oxidative stress, and can regulate various neurotrophic factors such as nerve growth factor. Although largely cross-sectional in design, there have been studies demonstrating an association between low vitamin D levels with schizophrenia, depression, and Alzheimer's Disease (15).

Methods

Subjects

The subjects selected for this study include 80 Iraqi pupils (40 conduct disorder and 40 in prosocial control groups), from primary schools from class 3 th,4 th,5 th and 6th in Baquba

city, randomly selected in a systematic random sample, with age ranged between 9- 15 years. This study was carried out during a period from september 2012 to June 2014.

Assessment and Scoring the child conduct behaviour

Rutter Child Behaviour Questionnaire (RCBQ) was used as a scale for diagnosis of behavioral disorders having ADHD, versus prosocial behavior. Rutter Child Behaviour Questionnaire for completion by teacher in its original version was developed by Rutter et al.(1967), it consist of 59 items, 39 items for total difficulties (conduct, Emotional, and hyperactivity) and 20 items for pro social trait (16).Special data sheet was designed for collection of two types of information for each child enrolled in this study.

1- Information completed by the child family

About the child and his family, include personal and socio demographic data, age, gender, class, school years of scholastic failure, parental age, education, occupation, death, birth,order, family size, crowding index. (number of family member number of rooms in the house) polygamy, divorce and child working status

2- Information completed by the class teachers

Score for each item either 0, 1 or 2 (dosen't apply, applies somewhat and certainly applies0. Child with a total score of nine or more (cut-off score at 50 th percentile),

Sample Collection

Five milliliters of venous blood sample were collected from each pupil of the two study groups who were selected from the primary school children. The serum was obtained by putting each blood sample in a clean dry plain tube and allowed to clot at 37 ^{o} C for 20 – 30 minutes, centrifuged at 3000 rpm for 15 minutes in Diyala Faculty of Medicine. Serotonin and vitamin D analysis was performed by using indirect enzyme linked immuonosorbent(IELISA) assay.

All tests were carried out in the hormones unit of the specialize Center of Endocrinology and Diabetes (Baghdad Russafa Health Directorate) in Baghdad. SPSS version 18 (statistical package for social sciences) was used for statistical analysis (17).

Results

The results showed that the mean serum 25(OH) vitamin D level was significantly ($p<0.05$) increased among pupils with normal behavior (20.57±3.29 ng/ml) than that in conduct behavior group(18.38±2.43 ng/ml) (table 1).

Table 1: The mean of serum 25(OH) vitamin D level in conduct and control groups

Groups	Number	Mean± SD (ng⁄ml)	t-test	p-value	Significance
Normal	40	20.57±3.29	2.225	0.043	S
Conduct	40	18.38±2.43			

The result of the present study also showed that the mean serum serotonin level was lowered (2.05± ng/ml) in pupils with conduct disorder as compared to that in control group (2.89±ng/ml) , but the differences statistically was not significant as shown in table (2).

Table 2: The mean of serum serotonin level in conduct and control groups

Groups	Number	Mean± SE (ng⁄ml)	t-test	p-value	Significance
Conduct	40	2.05 ± 0.58	0.948	0.359	NS
Normal	40	2.89 ± 0.73			

The comparative or the relationship between 25(OH) vitamin D and serotonin among conduct pupils was detailed in table (3). The data revealed that there is highly significant correlation ($p<0.001$) among them, with the simple linear regression between 25(OH) vitamin D and serotonin, when 25(OH) vitamin D goes up the serotonin rises two (figure 1).

Table 3: comparative between 25(OH) vitamin D and serotonin among conduct disorder goup

Hormone andneurotransmitter t- test	p-value	r	p-value
25(OH)vitaminD and serotonin 18.15	P<0.01 HS	0.208	0.456 HS
Simple Liner regretion	$Y^{\wedge}=0.568+0.809_X$ *r=0.205		

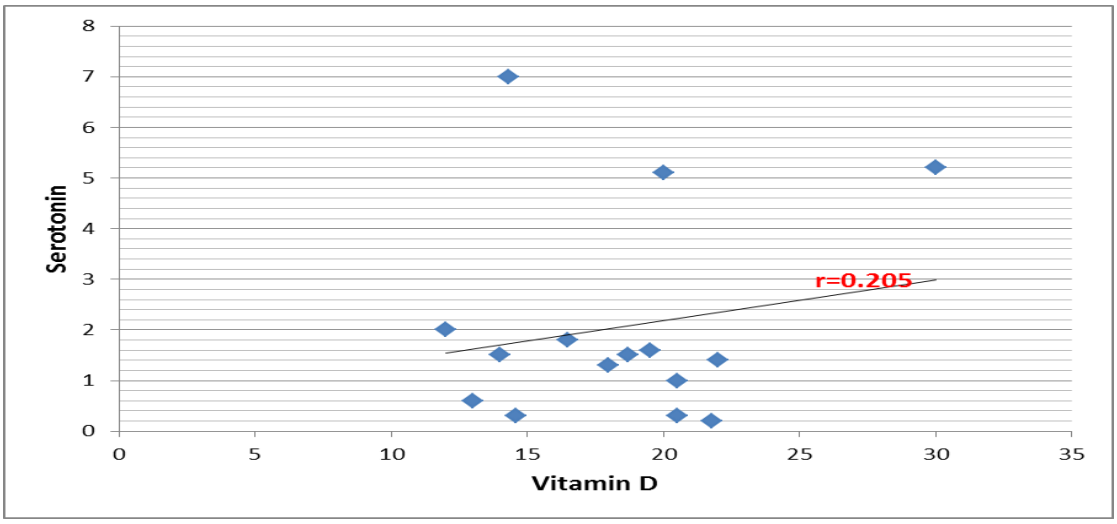

Figure (1): Correlation of25(OH) vitamin D and serotonin in conduct group

Discussion

The number of boys that included in this study was 80 pupils with the age range between 9 and 15 years old, there are little number of girls diagnosed with conduct disorder, thus girls were not considered in this study because of the variation in the sample size in addition to the variation in the adolescent time and hormones or life stage in this city.

The results of the current study found that the mean serum serotonin concentration is lowered in pupils with conduct behavior group than in normal behavior group. In accordance, Coccaro et al.(1997) correlates the conduct –aggressive behavior with lowered brain serotonin.The results of the present study showed that there were no significant differences in the mean serum serotonin concentration between the two groups, In fact, Dunlop and Nemeroff (2007) clarified that the variation in cortical and brain neuro transmitters during the school age periods may be contribute in the development of at least one the neuropsychiatric disorders. Similarly, Fineberg et al.(2008) stated that the pathway of the neurotransmitter is strongly influence the onset of many psychiatric disorders in patient, serotonin has received much attention as neurotransmitter because of the extensive innervation and its roles in the brain with the presence of many receptor distribution, also its roles in broad spectrum of central function and behaviors. Regarding to the vitamin D, the statistical analysis showed that there was no significant differences in the mean serum 25(OH) vitamin D, while the mean serum vitamin D is increased in control group than pupils in conduct group. This may be explained by the role of steroid hormones which are an important factors in cerebral chemistry, and

therefore are included in the modulation of human and animal behavior through linking with neurotransmitters, growth factors, neuroactive steroid and neuropeptide (Holi et al.,2000).

Patrick and Ames (2014) investigated that vitamin D hormone is conceder as a key regulator in synthesis brain serotonin by the enzyme tryptophan hydroxylase 2, that it contain the vitamin D response elements, and stated that when vitamin D level was lowered lead to variation in serotonin synthesis and then may be result abnormal development of the brain. Furthermore, Walther and Bader(2003) proved that the brain tryptophan is linked with the concentration of serotonin in the brain.Gong et al.(2013) showed that the lowered serum 25(OH) vitamin D concentration was correlated linked with the severity of autism. In contrast, D′Eufemia et al(1995) showed that many non autistic individuals are lacking to suitable concentration of tryptophan, but Passamonti et al.(2012) stated that the increases of tryptophan level lead to rapid with decreasing in the brain serotonin concentration in the normal individuals which have strong effect on their social behavior.

Conclusions

Generally, the present study displayed that the boys with conduct disorder who were already have abnormal behavior have decreased serum serotonin and 25(OH) vitamin D levels which they are present in nutrition, this may be due to the environmental factors that contribute in the disruption of behavior especially, there area where the samples collected were born and raise in a poor security and consider hot area, thus broken family because of parents by ware, need further studies and nutritional education in primary school children.

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