Comparative Study of Various Vitamins Level between Autism Spectrum Disorder Patients and Healthy Population to Assess Severity of Disorder in Rajasthan, India

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Abstract

Introduction: Autism spectrum disorder is a complex and mysterious neurodevelopmental disorder that appears in the early years of life. Autistic children are characterized by impaired social interaction and communication and fail to respond to certain stimuli exhibiting some restricted and repetitive behavior or action. Aims: To evaluate vitamin status [vit. A, vit. E and vit. D]. In children with autism spectrum disorder and healthy controls. Materials and Methods: This prospective study includes 150 autism spectrum disorder patients of age 2-15 yr as well as age, gender, matched 50 healthy children as controls. The degree of ASD severity was diagnosed by clinical psychologist by using Indian scale for assessment of autism (ISAA Score). Blood samples were collected from all participants and analyzed for vitamin A, vitamin E and Vitamin D. The Obtained Results were analyzed statistically to calculate significance of difference among them by calculating p-value. Results: There is significantly decrease levels of serum vitamin D & serum vitamin A were found in ASD patients. No significant difference were found in activity of serum vitamin E level was found in ASD subjects. Conclusions: From this study we would like to conclude that, due to multifactorial disorder, ASD treatment depends on the need of each individual. Thus, in ameliorating the ASD symptoms vitamin supplementation are recommended as alternative therapy.

Keywords: Vitamins, Autism Spectrum Population.

INTRODUCTION

Autism is a growing problem worldwide and possesses a greater healthcare and economic burden to the developing nations like India. Research is on rise in the last decade on understanding various aspects of this condition. It is estimated that there are approximately 1.7-2 million children with Autism Spectrum Disorder (ASD) in India, thus ASD is a significant public health concern [1]. A survey of the available literature suggests that nutritional and dietary interventions are considered routine treatment for development disorders including Autism spectrum disorder [2]. Developing countries lack relevant data because autism is not a common theme of research [3].

For maintaining human health vitamins and minerals are inevitable as they play a crucial role like as enzymatic cofactors in neurotransmitter production [4]. Insufficient intake of vitamins and minerals through poor food habit has been considered as one of the main contributing factor to child health problems. Vitamin A is capable of increasing the level of Oxytocin in ASD patients [5]. The serum level of vitamin D the best available marker has been shown to be significantly lower in autistic individuals than in healthy children [6]. Some of these biomarkers are indicative of Vitamin E insufficiency increase oxidative stress and poor detoxification and are associated with severity of this disorder [7].

Many studies suggested that children with autistic problems have a decreased ability to excrete toxic metals, leading to the higher body burden. Exposure to metals may considerably contribute towards the symptoms associated with autism spectrum disorder [8]. Bio elements play important role in the central nervous system. The lack or excess of essential minerals and trace elements are known to cause a variety of health problems and could contribute to the etiology of ASDs [9].

Citation: Nishtha Saral et al. Comparative Study of Various Vitamins Level between Autism Spectrum Disorder Patients and Healthy Population to Assess Severity of Disorder in Rajasthan, India. Sch J App Med Sci, 2021 Feb 9(2): 227-230.
So the current study is aimed to compare the vitamins level between Autism spectrum disorder patients and healthy population to assess severity of disorder.

**MATERIALS AND METHODS**

The study was designed to evaluate serum vitamins in 150 autism spectrum disorder patients as well as age, gender, matched 50 healthy children as controls in the department of biochemistry, S.M.S. Medical Collage, Jaipur (Rajasthan). They were recruited from the paediatric neuropsychiatric department of J.K Loan Hospital, Jaipur.

**Subject selection and study design**

This comparative study (Case-Control type of observational study) was conducted in the Department of Biochemistry, S.M.S Medical College, Jaipur. The subjects in our study were selected from child development centre (C.D.C.) of J K loan Hospital Jaipur.

**Distribution of subjects**

| Subjects          | Controls | Case (Autism Spectrum Disorder Patients) |
|-------------------|----------|-----------------------------------------|
|                   |          | Mild | Moderate | Severe |
| Male              | 33       | 32   | 31       | 29     |
| Female            | 17       | 18   | 19       | 21     |
| Total             | 50       | 50   | 50       | 50     |

**Subject selection**

Based on following inclusion and the exclusion criteria a Random selection of the subjects for the study was made on the basis of detailed history and proper clinical examination.

**Inclusion criteria**

1. **Age Range:** 2-15 Years.
2. **Autism Group:** Prior diagnosis of Autism by Indian Scale for Assessment of Autism (ISAA Score).
3. **Control Group:** In good mental and Physical health and no sibling with Autism spectrum disorders and no evidence of attention deficit disorder.

**Exclusion criteria**

1. Patients on vitamin/mineral supplement, use of any chelation treatment will be excluded from the study.
2. Children with epilepsy, Turner Syndrome, Down syndrome and any kind of medication were excluded from the study children of organic aciduria, dimorphic features, a diagnosis of fragile X and other serious neurological and psychiatric conditions or known medical conditions including endocrine, cardiovascular, pulmonary, liver kidney or other medical disease.

**Socio-economic Status**

This Study was also highlighted the relationship of Autism Spectrum Disorder Patients with their Parents education, occupation, work profile, their family income and area of residence like urban and rural background.

**Clinical Criteria**

The degree of ASD severity was diagnosed by clinical psychologist by using Indian scale for assessment of autism (ISAA Score). According to ISAA, this rates the child on a scale in each of the 40 areas included.

**The study was planned to carry out in two steps**

1. **Physical examination:** It was include age, sex, history of the disease etc.
2. **Biochemical examination:** 5 ml blood samples were collected in plain vials from the subjects. After 20 minute coagulation immediate centrifugation was performed for 10 minutes at 5000 rpm. All tests were done in separated serum by centrifugation. For remaining test serum was stored at -80 degree centigrade until the time of analysis. Estimation of serum vitamin A and vitamin E was performed using colorimeter.

Estimation of serum vitamin D were performed using ADVIA Centurie XP Immunoassay System; a fully automated random access immunoassay system in Immunology Lab of S.M.S. Medical College, Jaipur.

**RESULTS**

This prospective study includes 150 autism spectrum disorder patients of age Group 2-15 yr as well as age, gender, matched 50 healthy children as controls

**Table-1: Distribution of subjects according to gender (N=200)**

| Groups studied  | Gender of Subjects |          |
|-----------------|--------------------|----------|
|                 | Male n (%)         | Female n (%) | Total n (%) |
| Healthy Control | 33 (16.50)         | 17 (8.50) | 50 (25.00) |
| Autistic Patients | 92 (46.00)     | 58 (29)  | 150 (75.00) |
| Total           | 125 (62.50)        | 75 (37.50) | 200 (100.00) |
In our study, the results of different autism groups showed significantly decreased mean levels of vitamin A as compared to control group. The values of mean± SD of control group was 352.46 ± 82.86, mild autism group was 338.32 ± 118.98, moderate autism group was 329.94 ± 102.06 and severe autism group was 283.40 ± 116.12 with P value 0.009 (table no. 6 & figure no. 6; P<0.05).

Some studies have reported that 77.9% of ASD children were suffering from vitamin A deficiency, which known as the most important deficiency rate among the nutrients [10] Vitamin A deficiency leads to a decrease in learning and memory functions [11].

In our study, the results of the different autism groups were showed high significantly decreased mean levels of vitamin D as compared to control group. the values of mean± SD levels of serum vitamin D were found to be higher significantly decreased in different autism study group as compared to control group (P value <0.001) by Anova test.

Table 4 shows comparison of mean levels of serum vitamin A was found significant decrease in different autism group as compared to control group (P value 0.05) by Anova test.

Table 5 shows comparison of mean levels of serum vitamin D were found not significant in different autism group as compared to control group by Anova test.

In our study, the results of different autism groups was divided in three groups (Mild, Moderate, Severe) to compare with healthy control group. The association between variables was assessed.

Table 3 shows the Mean Level of Vitamins in Healthy controls and Autism Patients.

Table 4 shows comparison of mean levels using ANOVA test (n=50).

Table 5 shows comparison of mean levels of serum vitamin D (ng/ml) levels using ANOVA test (n=50).

Table 6 shows comparison of mean levels of serum vitamin E (ng/ml) levels using ANOVA test (n=50).

DISCUSSION

Autism spectrum disorder (ASD) is a developmental disability that can cause significant social, communication and behavioral challenges. There is often nothing about how people with ASD look that sets them apart from other people, but people with ASD may communicate, interact, behave, and learn in ways that are different from most other people. The learning, thinking, and problem-solving abilities of people with ASD can range from gifted to severely challenged. Some people with ASD need a lot of help in their daily lives; others need less.

In the present study, Vitamins status has been examined in Autistic and healthy children. Their correlation of ASD children with severity of disorder also observed. The data in this study are expressed as Mean ± SD. The statistical analysis was performed using Anova test. This was used to by using Pearson’s Correlation Coefficient (r). P-values was considered as high significant (P<0.001) and significant (P<0.05) respectively. Compare various groups of autism patients which was divided in three groups (Mild, Moderate, Severe) to compare with healthy control group. The association between variables was assessed.
Adams and colleagues showed that there was a reduced capacity for detoxification and energy transport and vitamin D deficiency children with ASD compared to controls.

In our study, there was found no significant differences of serum vitamin E in autism group as compared to control group (Table 5).

Few studies showed some evidence for reduced levels of vitamin E in children with ASD [14, 15] found three studies where vitamin E levels were measured; all the data reported lower vitamin E levels in children with ASD.

CONCLUSION

From this study we would like to conclude that, due to multifactorial disorder, ASD treatment depends on the need of each individual. Thus, in ameliorating the ASD symptoms vitamin supplementations are recommended as alternative therapy.

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