

# HORMONE DISORDER AND VITAMIN DEFICIENCY IN ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) AND AUTISM SPECTRUM DISORDERS (ASD)

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## Objective

Attention deficit hyperactivity disorder (ADHD) and Autism Spectrum Disorders (ASD) are two separate events that significantly change the lives of children (1). The pathophysiology of ADHD is complex and yet not clearly understood. Although there is no specific factor, there are hypotheses that it is multifactorial (2). For this reason, prenatal risk factors and genetic properties are the particularly emphasized variables in the etiology (3). However, this disease is observed quite frequently with comorbid conditions such as epilepsy, EEG abnormalities, iron deficiency, depressive disorders, and learning disabilities (4). ASDs are a group of biologically based neuro-developmental heterogeneous disorder and related with some known risk factors such as mutational or variant genes, advanced paternal age, prematurity, and birth complications (5-7). Recently, it has been reported that in particular, deficiency of Vitamin B12 and D can be concurrent in both groups of diseases and these can be included among the risk factors (7). Additionally, it has been published in 2011 that increased androstenedione levels in adults can be a risk factor for autism spectrum disorders (8). Association of subclinical hypothyroidism and ADHD is among the other reported risk factors.

By considering all these factors, we planned to study the thyroid hormones, and antibodies, vitamins B12 and D levels, ferritin levels, adrenal and gonadal steroid levels in children we diagnosed as ADHD and ASD in our region. Our study is unique in terms of including and evaluating all these risk factors mentioned in the literature.

## Material and methods and Results

### Material-methods

Patients between the ages of 2-18 years followed-up with the diagnosis of ADHD and ASD in the Van region were included in this study. The weights and heights of the patients were recorded and then the blood samples were obtained between 08:00-09:00 a.m. in the morning due to the diurnal variation of the hormone. 27 cases compatible with the patient group in terms of age and gender and who did not have the diagnostic criteria of ADHD and ASD were taken as the control group.

### Results

While there was no significant difference between the groups for thyroid hormone levels statistically, there was a significant difference in terms of vitamins B12 and D and ferritin statistically. While the highest ferritin and lowest vitamin B12 and vitamin D levels were found in the ASD group, the vitamin D level in the ADHD group was significantly lower than that of the controls, too. There was no statistically significant difference between the groups in terms of adrenal and gonadal hormone levels.

**Table 1. Comparison of the groups according to thyroid hormones, anti-bodies and tissue transglutaminase IgA levels**

	ADHD Mean ± SDS (Min-Max)	ASD Mean ± SDS (Min-Max)	Control Mean ± SDS (Min-Max)	p
TSH	2,27±0,76 (0,91-3,7)	2,03±0,93 (0,61-4,1)	2,61±1,45 (0,07-5,4)	>0,05
T4	1,46±1,71 (1-10,8)	1,11±0,13 (0,8-1,3)	1,13±0,16 (0,64-1,37)	>0,05
Anti-TPO	10,13±47,96 (0,4-264)	1,31±0,97 (0,57-4,6)	0,97±0,40 (0,45-2,2)	>0,05
Tissue transglutaminase Ig A	3,89±5,40 (0,0-30,0)	3,15±2,95 (0-10,8)	1,34±0,26 (1,09-1,6)	>0,05

**Table 2. Comparison of the groups according to vitamin B12, vitamin D, ferritin and folate levels**

	ADHD Mean ± SDS (Min-Max)	ASD Mean ± SDS (Min-Max)	Control Mean ± SDS (Min-Max)	p
vitamin B12	371,72±160,63 (156-924)	235,13±68,68 (116-401)	424,04±167,94 (189-900)	0,001
Folate	10,16±2,93 (4-15)	9,17±3,96 (4-16)	8,52±3,75 (2,9-20)	>0,05
25 OH Vitamin D	19,49±8,53 (8,1-37,4)	15,11±7,47 (3,9-22,5)	28,73±9,04 (11,6-44,7)	<0,001
Ferritin	39,43±15,00 (16-75)	50,88±31,99 (17-133)	29,14±17,74 (1,5-70)	>0,05

**Table 3. Comparison of the groups according to hormone levels**

	ADHD Mean ± SDS (Min-Max)	ASD Mean ± SDS (Min-Max)	Control Mean ± SDS (Min-Max)	p
DHEAS	59,75±65,53 (5,4-288)	108,53±128,91 (2-450)	85,9±94,76 (3,2-337,1)	>0,05
Androsetenedion	0,46±0,41 (0,04-1,95)	0,71±0,67 (0,3-2,49)	1,12±1,72 (0,3-6,28)	>0,05
T. Testosterone	0,52±0,19 (0,45-1,17)	0,71±0,45 (0,45-1,23)	2,30±4,57 (0,45-17,88)	>0,05
ACTH	29,44±21,09 (13-65)	21,50±14,85 (11-32)	20,56±7,40 (7,5-24,8)	>0,05
Cortisol	9,03±4,71 (4,8-16)	10,03±5,61 (4-15,1)	10,62±4,18 (6-15,1)	>0,05
17(OH) Progesterone	1,06±0,61 (0,37-3,24)	0,95±0,40 (0,21-1,52)	0,85±0,59 (0,16-2,75)	>0,05

## Conclusion

Our study is unique in the literature in terms of including and evaluating ADHD and ASD and the risk factors vitamin B12, ferritin, vitamin D, adrenal androgens, celiac disease and subclinical hypothyroidism. Besides, with the current study, we want to screen the levels and importance of supplementation of vitamin B12 and D in ASD and ADHD group patients and to especially emphasize the informing of the population about vitamin B12 and D deficiency in terms of prevention of these diseases and necessity of stimulation of the health workers in order to take the measures such as diet relieving the deficiency and supplementation.

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