To Explore Serum Vitamin D Levels in Children with Autism Spectrum Disorder

Komal Sattar[1], Aizaz Ali Khan[2], Fozia Baloch[3]*, Sonia Saleem[4], Amanullah Lail[5], Ajet Kumar[6]

[1]Komal Sattar, Resident Dermatology, Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad Pakistan
Email: Komalsattararain@gmail.com

[2]Aizaz Ali Khan, Resident Paediatrics, Dr. Ziauddin Hospital Keamari Campus Karachi Pakistan
Email: aizazalikhan94@gmail.com

[3]Fozia Baloch, Assistant Professor of Paediatrics, Bilawal Medical College for Boys LUMHS Hyderabad Pakistan
Email: balochfozia94@gmail.com

[4]Sonia Saleem, Assistant Professor of Paediatrics, Al-Aleem Medical College, Ghulab Devi Teaching Hospital Lahore Pakistan
Email: docsoniaumer@gmail.com

[5]Amanullah Lail, Assistant Professor of Paediatrics, Dow University of Health Sciences, Dow Medical College Karachi Pakistan
Email: aman_lail@yahoo.com

[6]Ajet Kumar, Senior Lecturer Pharmacology, Ghulam Muhammad Mahar Medical College Sukkur Pakistan
Email: drajetkumar@gmail.com

Abstract

Background: A complicated neurological ailment that can cause problems for a person's entire life is autism spectrum disorder (ASD). Its social and economic consequences are considerable. ASD is distinguished by difficulty in social communication and a proclivity for repeated behaviors and interests. Autism's prevalence has increased significantly during the last three decades, now impacting 7.6 persons per 1000 people, or around one in every 132 people. Vitamin D deficiency has emerged as a global health concern, driven by factors such as geographic location, season, skin color, indoor lifestyle, air pollution, and obesity. Researchers from many nations found that children with autism spectrum disorder have considerably lower levels of serum vitamin D than healthy youngsters. Objective: To explore serum vitamin D levels in children with ASD and compare them to those of healthy children Study design: A case control study Place and Duration: This study was conducted in Bilawal Medical College for Boys LUMHS Hyderabad from November 2022 to November 2023. Methodology: To perform this study, children diagnosed with autism spectrum disorder aged 3 to 10 years, as validated by a pediatric neurologist, were purposefully enrolled after receiving informed written consent from their parents. The study group consisted of 80 children with Autism Spectrum Disorder. In addition, 80 children who appeared to be healthy were chosen for comparison, with age, BMI, and gender matching. All participants came from middle-class socioeconomic backgrounds. Results: There were a total of 80 children who were enrolled in this research. The mean age for the children who were having ASD was 6.16 years while the ones in the healthy group was 6.04 years. The serum 25(OH) D was low in the ASD group. Overall, 80% of the children were vitamin D deficient in the ASD group while 66.25% were deficient in the control group. Conclusion: Vitamin D insufficiency affects both children with ASD and those without the disease.

Keywords: **Vitamin D Deficiency, Autism Spectrum Disorders, Children.**

Introduction

A complicated neurological ailment that can cause problems for a person's entire life is autism spectrum disorder (ASD) [1], its social and economic consequences are considerable. ASD is distinguished by difficulty in social communication and a proclivity for repeated behaviors and interests [2]. The term "spectrum" refers to the various ways in which the condition manifests itself, ranging in severity, developmental stage, and age [3]. Autism's prevalence has increased significantly during the last three decades, now impacting 7.6 persons per 1000 people, or around one in every 132 people [4]. In Bangladesh, ASD prevalence spans from 0.15% to 0.8%, with rural areas having lower rates (0.075%) than Dhaka, which has an alarmingly high prevalence of 3% [5].

Environmental and genetic variables most likely play a combined role in the development of autism spectrum disorder (ASD). According to John J. Cannell, low vitamin D levels during pregnancy and early childhood may be a significant environmental cause for ASD. [6]. Vitamin D is a steroid hormone that is largely synthesized in response to UVB sun exposure. Its primary function is to maintain calcium

doi.org/10.31838/hiv24.01.1 Received: 09.11.23, Revised: 14.12.23, Accepted: 01.01.24.

and phosphate balance, but it also has a significant impact on brain development, neurotransmitter synthesis, and neuroprotection via the vitamin D receptor (VDR) found in many cells, including those in the CNS [7]. Furthermore, vitamin D can regulate over 200 genes, including those involved in DNA repair, thereby stabilizing the genome and protecting against oxidative stress [8].

Vitamin D deficiency has emerged as a global health concern, driven by factors such as geographic location, season, skin color, indoor lifestyle, air pollution, and obesity [9]. Researchers from many nations found that children with autism spectrum disorder have considerably lower levels of serum vitamin D than healthy youngsters. For example, in a major research in Qatar, autistic children had significantly lower vitamin D levels than controls [10]. Similarly, a study of Chinese children found significantly lower serum vitamin D levels in those with autism compared to typically developing youngsters [11]. Furthermore, data suggests a negative relationship between circulating vitamin D levels and the severity of autistic symptoms, as measured by the Childhood autistic Rating Scale [12].

While some research has revealed a link between vitamin D insufficiency and autism spectrum disorder (ASD), others have discovered no significant variations in serum vitamin D levels between ASD patients and healthy controls. In Pakistan, growing urbanization, increased indoor activities, and darker skin color all contribute to a significant prevalence of deficiency of vitamin D among children and women of reproductive age [13].

Methodology

The Ethical review committee approved this research. To perform this study, children who were having autism spectrum disorder aged 3 to 10 years, as validated by a pediatric neurologist, were purposefully enrolled after receiving informed written consent from their parents.

Exclusion criteria: The study excluded ASD children with acute diseases, Down syndrome, malabsorption issues, epilepsy, renal insufficiency, or cerebral palsy. Children with ASD who are presently taking multivitamins, calcium supplements, or vitamin D supplements were also precluded from participation. The study group consisted of 80 children with Autism Spectrum Disorder. In addition, 80 children who appeared to be healthy were chosen for comparison, with age, BMI, and gender matching. All participants came from middle-class socioeconomic backgrounds. Following selection, parents were instructed to bring their children to the Department of Physiology at 8 a.m. on the exam day, in the fasting state. Each child's 5 ml of venous blood was collected aseptically and promptly transported to the laboratory. Serum levels of 25(OH) D and creatinine were determined using the CMIA method on an automated analyzer, specifically the Architect plus ci4100. SPSS version 26 was used to analyze the information.

Results

For this study, a total of eighty children were registered. The mean age for the children who were having ASD was 6.16 years while the ones in the healthy group was 6.04 years. Table number 1 shows the demographics and general characteristics of the children enrolled in this study.

Table 1: The Demographics and General Characteristics of the Children.

Characteristics	ASD Group (n=80)	Control Group (n=80)
Age in years (mean)	6.16	6.04
Gender		
Male	45	47
Female	35	33
BMI in kg/m2 (mean)	15.99	16.49

The ASD group's serum 25(OH) D level was low. Table number 2 shows the Serum 25(OH) D and serum creatinine levels in both groups.

Table 2: Serum 25(OH) D and Serum Creatinine Levels in Both Groups.

Parameters	ASD Group (n=80)	Control Group (n=80)
Serum creatinine (mg/dL)	0.46	0.49
Serum 25(OH)D (ng/ml)	15.45	16.23

Table number 3 shows the relationship of ASD with insufficiency and deficiency of vitamin D.

Table 3: Relationship of ASD With Insufficiency and Deficiency of Vitamin D.

Groups	Serum Vitamin D status	
	Sufficient	Deficient and insufficient
ASD Group	16	64
Control Group	27	53

Discussion

The mean serum vitamin D levels in the ASD and control groups were both below the typical reference range. Additionally, the mean serum vitamin D level was lower in the ASD group compared to the control group; however, this difference was not statistically significant. This outcome is in line with the findings of previous studies. [14]. For instance, Molley et al. found no appreciable differences in 25(OH)D concentrations between individuals with ASD and control people in a

cohort study carried out in the United States. Furthermore, it was shown that 61% of the youngsters in the total cohort were vitamin D deficient [15].

Adams et al. conducted a separate study in Arizona, USA, comparing children with ASD to non-sibling, neurotypical controls who were matched for age, gender, and geographic region [16]. Children with ASD and the control group did not significantly differ in their serum vitamin D levels, according to the study. Notably, the vitamin D levels in both groups were inadequate.

Serum 25(OH)D levels in children with ASD were compared to healthy controls of the same age and gender in a study done in Turkey by Ugur and Gürkan [17]. There was no discernible change in the two groups' serum vitamin D levels, according to the researchers.

Cultural practices frequently require covering the majority of the body when outside, which reduces exposure to sunlight. Furthermore, the prevalence of brown skin and melanin pigment in the population creates a natural barrier to solar absorption. Furthermore, the severe air pollution in Dhaka absorbs UVB rays, reducing cutaneous vitamin D production. With few food sources of vitamin D available, the average intake is insufficient to achieve the recommended levels [19].

Autism spectrum disorder is commonly recognized to be caused by a mix of genetic predisposition and environmental variables. Thus, when genetically predisposed infants suffer from vitamin D insufficiency in their early years, it may act as an environmental trigger for ASD. In our investigation, the subjects were fairly advanced in terms of neurodevelopment. To supplement our findings, a similar study with younger age groups and maternal serum vitamin D levels could provide more insight and clarity [20].

Conclusion

Vitamin D insufficiency affects both children with ASD and those without the disease. While the average serum vitamin D level was lower in children with ASD than in healthy controls, the difference was not statistically significant.

Funding Source

There was no outside funding source utilized for the conduct of this study.

Conflict in the Interest

Regarding their interest in carrying out this investigation, the writers had no conflicts of interest.

Permission

To guarantee adherence to ethical norms and guidelines, approval from the ethics committee was sought before to starting this investigation.

References

Afroz S, Begum S, Shahjadi S, Siddiqi UR, Mahruba N. Evaluation of serum vitamin D in children with autism spectrum disorder.

Hashemzadeh M, Moharreri F, SOltanifar A. Comparative study of vitamin D levels in children with autism spectrum disorder and normal children: A case-control study. Journal of Fundamentals of Mental Health. 2015 Jul 1;17(4).

Gopen KK, Mostaque M, Shaheen A. Evaluation of Serum Vitamin D Level as Risk Factor for Children with Autism Spectrum Disorder. J Neurosci Neuropsyc. 2021;4:102.

Kalra R, Kaur D, Verma R, Ghildiyal R. Vitamin D deficiency in children and adolescents with Autism and ADHD–a retrospective study. International Journal of Indian Psychology. 2020;8(1).

Şengenç E, Kıykım E, Saltik S. Vitamin D levels in children and adolescents with autism. Journal of International Medical Research. 2020 Jul;48(7):0300060520934638.

Cannell JJ. Autism and vitamin D. Med Hypotheses.2008; 70:750–59, DOI: 10.1016/j.mehy.2007.08.016

Meguid NA, Hashish AF, Anwar M, Sidhom G. Reduced serum levels of 25-hydroxy and 1, 25-dihydroxy vitamin D in Egyptian children with autism. The journal of alternative and complementary medicine. 2010 Jun 1;16(6):641-5.

Arastoo AA, Khojastehkia H, Rahimi Z, Khafaie MA, Hosseini SA, Mansouri MT, Yosefyshad S, Abshirini M, Karimimalekabadi N, Cheraghi M. Evaluation of serum 25-Hydroxy vitamin D levels in children with autism Spectrum disorder. Italian Journal of Pediatrics. 2018 Dec;44:1-5.

Mansour A, Amer A, Sobh A, Zaki M, Abou-Elsaad T. Vitamin D profile in autism spectrum disorder children and its relation to the disease severity. The Egyptian Journal of Otolaryngology. 2024 Jan 18;40(1):7.

Dağidir Hg, Bukan N, Arhan E, Tombul N, Arslan B, Temel Eü. Autism and Vitamin D. Journal of Gazi University Health Sciences Institute.;2(1):28-35.

Hassan MM, Emam AA, Radwan A, Abdelhameed A, Salah Eldin S, Mohamed M. Is Deficiency of 25-Hydroxy Vitamin DA Risk Factor for Autism? A Preliminary Study. Egyptian Journal of Ear, Nose, Throat and Allied Sciences. 2021 Jul 12;22(22):1-9.

Gong Z, Luo C, Wanga L, Shena L, Wei F, Tong RJ, et at. Serum 25-hydroxyvitamin D levels in Chinese children with autism spectrum disorders. NeuroReport.2013; 25:23–27. DOI: 10.1097/WNR.0000000000000034

Koc¡ovska E, Andorsdo´ttir G, Weihe P, Halling J, Fernell E, et at. Vitamin D in the General Population of Young Adults with Autism in the Faroe Islands. J Autism Dev Disord.2014; 44:2996–3005. DOI: 10.1007/s10803-014-2155-1

Bener A, Khattab AO, Al-Dabbagh MM. Is high prevalence of Vitamin D deficiency evidence for autism disorder? In a highly endogamous population. J Pediatr Neurosci.2014; 9: 227–33. DOI: 10.4103/1817-1745.147574

Molloy CA, Kalkwarf HJ, Courtney PM, Mills JM, Hediger ML.Plasma 25(OH)D concentration in children with autism spectrum disorder. Dev Med Child Neurol.2010;52: 967-71. DOI: 10.1111/j.1469-8749.2010.03704.x

Adams JB, Audhya T, McDonough-Means S, Rubin RA, Quig D, et al. Nutritional and metabolic status of children withautism vs. neurotypical children, and the association with autism severity. Nutr. Metab. 2011; 8:34-66. DOI: 10.1186/1743-7075-8-34

Ugar C¸ Gurkan CK. Serum vitamin D and folate levels in children with autism spectrum disorders. ýRes. Autism Spectr. Disord. 2014; 8:1641–47. DOI:

10.1016/ j.rasd.2014.09.002
Jia F, Wang B, Shan L, Xu Z, Staal WG, Du L. Core Symptoms of Autism Improved after Vitamin D Supplementation. PEDIATRICS.2014; 135:1098-4275. DOI: 10.1542/ peds.2014-2121
Feng J, Shan L, Du L, Wang B, Li H, Wang W, et al. Clinical improvement following vitamin D3 supplementation in Autism Spectrum Disorder. Nutr Neurosci.2017; 20:284-90. DOI: 10.1080/1028415X. 2015.1123847.
Saad K, Abdel-Rahman AA, Elserogy YM, Al-Atram AA, ElHoufey AA, Othman HK, et al. A Randomized controlled trial of vitamin D supplementation in children with autism spectrum disorder. J. Child Psychol. Psychiatry. 2018; 59: 20–29. DOI: 10.1111/jcp p.12652