

The Nutritional Parameters in Children with Delays in Speech

İlknur Sürücü Kara¹, İlke Dolğun², Cuma Mertoğlu³

¹Department of Child Health and Diseases, Erzincan Binali Yıldırım University, Mengücek Gazi Training and Research Hospital, Erzincan, Türkiye

²Department of Anesthesiology and Reanimation, Erzincan Binali Yıldırım University, Mengücek Gazi Training and Research Hospital, Erzincan, Türkiye

³Department of Clinical Biochemistry, İnönü University Faculty of Medicine, Malatya, Türkiye

Cite this article as: Sürücü Kara İ, Dolğun İ, Mertoğlu C. The nutritional parameters in children with delays in speech. *Cerrahpaşa Med J*. 2025, 49, 0065, doi:10.5152/cjm.2025.24065.

What is already known on this topic?

- Minerals and vitamins are closely related to cognitive performance. Cognitive functions may be affected by the deficiency of vitamins and minerals necessary for the regulation and continuity of neurotransmitter synthesis, membrane ion pumps, receptor binding, etc.
- Vitamin B12 deficiency, vitamin D deficiency, and iron deficiency may cause neurocognitive disorders such as irritability, attention deficit, learning disabilities, and poor language development.

What this study adds on this topic?

- Hemoglobin, iron, vitamin B12, and vitamin D levels have been evaluated in children with isolated speech delay/specific language disorders and compared to those of age-matched healthy controls.
- Vitamin B12 deficiency and iron deficiency were demonstrated in our patients with isolated speech delay/specific language disorders.
- Maintaining a balanced diet is crucial during early childhood. In children, monitoring vitamin and mineral levels when clinically indicated, and providing appropriate supplementation in cases of deficiency, may support optimal neurodevelopment and help reduce the risk of speech and language delays.

Abstract

Objective: This study aimed to examine and compare the data on nutritional parameters in children with specific language impairments.

Methods: Children under 5 years of age who presented to the outpatient clinic with isolated speech delay and were diagnosed with a specific language disorder, along with a healthy control group, were evaluated. The hemoglobin, iron, vitamin B12, and vitamin D levels of the patients were recorded after normal values and deficiency limits were determined for each age group.

Results: Of the 188 children, 94 were in the control group and 94 were in the patient group. The control group was the same age and gender as the patients. Seventy-one (75.5%) of the patients were male and 23 (24.5%) were female. The mean age was 2.70 ± 0.65 ; the median age was 2.66 (min-max: 1.50-3.92) years. The mean serum iron levels in the patient group ($67.95 \pm 41.86 \mu\text{g/dL}$) were significantly lower than in the control group ($81.59 \pm 37.34 \mu\text{g/dL}$) ($P = .008$). B12 deficiency was significantly higher in the patient group (30%) than in the control group (16%) ($P = .037$). Other nutritional parameters of the patient and control groups were similar.

Conclusion: Low iron levels and vitamin B12 deficiency may be effective factors in speech delay. It is important to the nutritional parameters for speech delay and to treat vitamin deficiencies if present.

Keywords: Children, iron, nutrition, speech delay, vitamin B12

Introduction

In children, the growth and development process starts in the intrauterine period and continues until the completion of adolescence. Psychological, biological, and social factors are important in the development process during the first 3 years of brain development and maturation, and negativities in this process can sometimes create changes that can be severe and permanent.¹ Minerals and vitamins are closely related to cognitive performance. Cognitive functions may be affected by the deficiency of vitamins and minerals necessary for the regulation and continuity of neurotransmitter synthesis, membrane ion pumps, receptor binding, etc.² Cognitive functions such as verbal learning and memory have been shown to improve with mineral and vitamin supplementation.¹⁻⁴

Vitamin D deficiency has been associated with neuropsychiatric diseases such as schizophrenia, autism, and attention deficit hyperactivity.^{2,5} Vitamin B12 deficiency may cause cognitive impairment, neurodegenerative diseases, and mood disorders. Iron deficiency may lead to neurocognitive disorders such as irritability, attention deficit, learning disabilities, and poor language development.^{1-3,6} Language impairment in early childhood is defined as a deficiency in both expressive language and receptive language. Speech disorders include clinical diagnoses of childhood fluency disorder (stuttering), speech sound disorder, social (pragmatic) communication disorder, and nonspecific communication disorder.⁷ Hearing impairments, neurological diseases, metabolic diseases, neurometabolic diseases, autism spectrum disorders, social environment, anesthesia, etc., can cause developmental delay and/or speech delay.^{7,8} There is no definitive evidence that short-term and single anesthesia

Received: December 16, 2024 **Revision Requested:** February 12, 2025 **Last Revision Received:** March 9, 2025 **Accepted:** April 22, 2025 **Publication Date:** October 24, 2025

Corresponding author: İlknur Sürücü Kara, Department of Child Health and Diseases, Erzincan Binali Yıldırım University Mengücek Gazi Training and Research Hospital, Erzincan, Türkiye **e-mail:** drillknursurucu@gmail.com

DOI: 10.5152/cjm.2025.24065

administered during infancy has a significant neurodevelopmental effect.⁸ Specific language impairment is a developmental disorder characterized by severe problems in understanding and/or expressing spoken language without hearing loss, intellectual disability, or emotional impairment. Specific language impairment affects about 7%-8% of children in kindergarten.⁹

This study aimed to investigate the effect of nutritional parameters on speech delay by evaluating hemoglobin, serum vitamin D, vitamin B12, and iron levels in patients with speech delay who presented to the outpatient clinic.

Methods

Ethics Committee Approval

Ethics committee approval was obtained from the ethics committee of the clinical research ethics committee of the Erzincan Binali Yıldırım University (Approval no: 04/04 Date: 30, April 2019). This study was conducted in accordance with the Declaration of Helsinki.

Case and Control Group Selection

The files of patients admitted to the pediatric outpatient clinic of Erzincan Binali Yıldırım University Mengücek Gazi Training and Research Hospital in Türkiye between 2014 and 2019 were examined. Only the files of patients diagnosed with isolated speech delay or specific language disorder and the files of the healthy control group were included in the study. Those with different diagnoses such as gastroenteritis and upper respiratory tract infections at the time of presentation were excluded from the study. Those with neurological disease, recognized genetic disease, metabolic disease, intellectual disability, hearing loss, recurrent otitis media, chronic otitis media, developmental delay, psychiatric problems (autism spectrum disorder, attention deficit, etc.), and premature birth history were excluded. Patients aged 1.5-4 years who presented with delayed speech were included in the study. Only those who had problems in using language as a result of the Denver developmental test were included in the study. These included children who were appropriate for their peers in other developmental tests. The control group consisted of healthy children of the same age and sex as the patients with speech delay. The study included patients with delays in speech and patients as a control group. Patients in both groups were grouped as 18-24 months, 24-36 months, and 37-48 months according to their age. Hemoglobin, iron, vitamin B12, and vitamin D levels were recorded.

Laboratory Evaluation

Hemoglobin level was considered as anemia at the age of 0.5-6 years if it was below 10.5 gr/dL.¹⁰ Using the reference range in the package insert of the iron kit, serum iron levels below 30 µg/dL were considered as iron deficiency; if B12 vitamin level was <300 pg/mL deficiency, and if 300-900 pg/mL it was considered to be normal. About 25 OH vitamin D levels were accepted as follows: <5 ng/mL as a severe deficiency, 5-15 ng/mL as a moderate deficiency, 16-20 ng/mL as insufficient, and 21-100 ng/mL as sufficient.^{11,12}

It is checked whether the patients and healthy children (control group) were anesthetized for any reason (operation, emergency intervention, suturing an injury, circumcision, etc.).

Family Consent for the Study

Since this was a retrospective study, consent forms were not obtained from the families of the patients and the control group of healthy children.

Statistical Analysis

Both the diagnoses of speech delay and the data of healthy children as the control group were compared with the SPSS statistical analysis program version 20.0 (IBM SPSS Corp.; Armonk, NY, USA) was used for data analysis. Categorical variables were analyzed, and frequency, percentage, mean and SD, median (minimum-maximum) values were written. When independent variables were used for quantitative data, the independent samples *t*-test was used in normal distribution, and Mann-Whitney *U* test was used in non-normal distribution. Fisher exact test and chi-square tests were used for qualitative data. For all statistical tests, *P* < .050 was considered statistically significant.

Results

Of the 188 cases, 94 were in the control group and 94 were in the patient group. Seventy-one (75.5%) of the patients were male and 23 (24.5%) were female. The mean age was 2.70 ± 0.65 ; the median age was 2,66 (min-max: 1.50-3.92) years. The number of patients was 16 (17.02%) between the ages of 18-24 months, 43 (45.75%) between the ages of 24 and 36 months, and 35 (37.23%) between the ages of 36 and 48 months. The control group was the same age and gender as the patients. Mean serum iron levels in the patient group were significantly lower than in the control group (*P* = .008). B12 deficiency was significantly higher in the patient group than in the control group (*P* = .037). The number of people with anemia, iron deficiency, and severe deficiency/moderate deficiency/insufficiency of vitamin D was similar in the patient group and the control group (Table 1). Mean hemoglobin levels, mean iron-binding capacity, mean vitamin B12 levels, and mean vitamin D levels were similar (Table 2).

According to age groups of patients, mean iron levels (*P* = .030) were higher in patients between 18 and 24 months than in children with patients between 37 and 48 months. Iron-binding capacity levels (*P* = .046) were higher in patients between 18 and 24 months than in children with patients between 37 and 48 months. Other nutritional parameters between age groups were similar in patients (Table 3). According to age groups, mean hemoglobin levels, iron levels, iron-binding capacity levels, vitamin B12 levels, and vitamin D levels were similar in the control group (Table 3). None of them had a history of an operation requiring long-term and repeated anesthesia.

Discussion

Speech delays are a neurodevelopmental disorder called DSM-5 communication disorders. The prevalence of language disorder is estimated to be 3-8%.^{13,14} In 30-50% of children with delays in speech, additional psychiatric diseases such as attention deficit hyperactivity, mood disorder, and anxiety disorders can be observed. Chronic otitis media or hearing loss can impair speech.^{7,15} Specific language impairment in children is a speech delay that occurs without hearing impairment or intellectual disability. The stages of language development of these children do not occur at normal times. These children can learn their mother tongue with little effort and little training (individual speech and language therapy, environmental planning, and family approach). They can catch up with their peers. Intermittent language and neuromotor developmental assessment should be performed. If abnormalities in neuromotor development are noticed, magnetic resonance imaging, electroencephalography, and metabolic evaluation should be performed to investigate neurodevelopmental and neurometabolic disorders. In men, speech delays are more frequent.^{7,14,16} Boys are 3 times more likely than girls to acquire their first words late because their vocabulary is smaller than that of

Table 1. Comparison of Demographic Data and Nutritional Deficiencies of Children with Speech Delay and Healthy Control Group

	Patients	Control group	
	n (%)	n (%)	P
Total	94 (100)	94 (100)	
Gender			
Female	23 (24.50)	23 (24.50)	
Male	71 (75.50)	71 (75.50)	
Anemia	6 (6.40)	13 (13.80)	.145
Iron deficiency	15 (15.9)	8 (8.5)	.209
Vitamin B12 deficiency	28 (30.0)	15 (16.0)	.037*
Vitamin D deficiency/insufficiency	34 (36.0)	43 (46.0)	.284

Hemoglobin level below 10.5 g/dL at 0.5-6 years of age was considered anemia. Iron deficiency <30 microgram/dL, vitamin B12 level <300 pg/mL was considered deficient, and 300-900 pg/mL as normal. 25 OH vitamin D level <5 ng/mL was considered as severe deficiency, 5-15 ng/mL as moderate deficiency, 16-20 ng/mL as insufficiency, and 21-100 ng/mL as adequate.

For categorical variables, the chi-square tests and multiple comparisons were used. The mean difference is significant at the <.05 level.

*B12 deficiency was significantly higher in the patient group than in the control group.

girls.^{16,17} Only children with specific language impairments were included in this study. In this study, the ratio of boys to girls was 3.08. It was consistent with the literature.

Worldwide, 41.7% of children have iron deficiency.¹⁸ In this country, the incidence of iron deficiency anemia was reported to be between 1.4% and 62.5% in studies conducted in various cities.¹⁹ If iron deficiency anemia becomes chronic, it leads to short and long-term neurocognitive disorders such as poor language development, a decrease in environmental sound perception, a decrease in visual attention and concept gain, motor skills, cognitive processes, and arithmetic school success.^{6,19,20} Iron deficiency anemia adversely affects mental development, psycho-motor development, and average speech development in children.²⁰ In

this study, the serum iron levels of the patients were lower than those of the control group. It was compatible with the literature.

B12 deficiency may lead to multiple neurological findings such as peripheral neuropathy, mood-state and behavioral changes, psychosis, memory problems, psychosis, and autonomic dysfunction.^{3,4} Vitamin B12 is necessary for neuron structure and myelination.²¹ In a systematic review of 63 articles, it was reported that there is a nutritional deficiency related to vitamins (vitamin A, B1, B12, C, D) with inadequate intake in individuals with autism and individuals with a broad autism phenotype who had severe self-imposed dietary restrictions. It has been reported that 1% of patients with autism spectrum disorder in Türkiye have vitamin B deficiency.^{22,23} It has been reported that 0.03%-48.8% of healthy individuals in Türkiye have vitamin B12 deficiency, and in a study conducted in this city, 5.5% of healthy children have vitamin B12 deficiency.¹² In this study, the number of patients with B12 deficiency was significantly higher in the patient group than in the control group. It has been reported that there is a relationship between elevated B12 and oxidative stress, and vitamin B12 may be elevated in neurodevelopmental disorders.²⁴ There were no elevated vitamin B12 levels in the patients and the control group.

As shown in the literature, vitamin D has an important role in cognitive functions. Prenatal vitamin D deficiency may lead to permanent changes in brain structure and function. Vitamin D status in newborns is associated with schizophrenia risk, low vitamin D level is a risk factor for autism, and vitamin D levels in attention deficit and hyperactivity disorders are low. It has been reported that 30%-60% of people in the world have vitamin D deficiency, and in a study conducted in the city, 50.69% of children have vitamin D deficiency.¹¹ In this study, no significant difference was found in mean vitamin D levels when compared with the control group. In addition, vitamin D deficiency, insufficiency, and sufficiency were similar in patients and the control group.

General anesthesia may affect different developmental areas at different ages. In a systematic review of 44 articles, it was reported that multiple or long-term anesthesia exposures may have detrimental effects on neurodevelopment in children, but a single exposure to general anesthesia does not cause a significant effect on general neurodevelopment.⁸ In this study, none of the patients had a history of surgery that required long-term or repeated anesthesia.

Limitations: This is retrospective and single center. The information of the patients and the control group consisting of healthy children could be obtained from their files or from the notes

Table 2. Comparison of Nutritional Parameters of Children with Speech Delay and Healthy Control Group

	Patients Mean ± SD/Median (Min.-Max.)	Control Group Mean ± SD/Median (Min.-Max.)	P
Hemoglobin levels (gr/dL)	12.41 ± 0.92/12.40 (9.7-14.40)	12.68 ± 0.95/12.80 (10.10-14.80)	.055
Iron levels (µg/dL)	67.95 ± 41.86/60.00 (11.00-232.00)	81.59 ± 37.34/78.50 (12.00-199.00)	.008**
Iron binding capacity (µg/dL)	315.31 ± 76.90/307.00 (182.40-575.00)	294.77 ± 74.19/272.00 (167.00-576.00)	.082*
Vitamin B12 levels (pg/mL)	438.79 ± 207.02/384.00 (190.00-927.00)	454.22 ± 152.25/426.00 (185.00-896.00)	.128*
Vitamin D levels (ng/mL)	22.95 ± 8.88/21.85 (7.17-24.45)	24.41 ± 13.13/ 23.69 (7.00-96.30)	.394*

Hemoglobin level below 10.5 g/dL at 0.5-6 years of age was considered anemia. Iron deficiency <30 microgram/dL, vitamin B12 level <300 pg/mL was considered as deficiency, and 300-900 pg/mL as normal. 25 OH vitamin D level <5 ng/mL was considered as severe deficiency, 5-15 ng/mL as moderate deficiency, 16-20 ng/mL as insufficiency, and 21-100 ng/mL as adequate.

Results were presented as mean ± SD/median (minimum-maximum).

*Mann-Whitney U test was performed, otherwise independent samples t-test was used. The mean difference is significant at the <.05 level.

**Mean serum iron levels in the patient group were significantly lower than in the control group

Table 3. Nutritional Parameters According to Age Groups in Patients with Speech Delay and Healthy Control Group

	Patient				Control			
	18-24 months Mean $\pm$ SD/ Median (Min.-Max.)	25-36 months Mean $\pm$ SD/ Median (Min.-Max.)	37-48 months Mean $\pm$ SD/ Median (Min.-Max.)	P	18-24 months Mean $\pm$ SD/ Median (Min.-Max.)	25-36 months Mean $\pm$ SD/ Median (Min.-Max.)	37-48 months Mean $\pm$ SD/ Median (Min.-Max.)	P
Hemoglobin levels (g/dL)	12.13 $\pm$ 0.92/ 12.00 (10.30-14.10)	12.40 $\pm$ 0.93/ 12.40 (10.10-14.40)	12.55 $\pm$ 0.90/ 12.60 (9.70-14.40)	.306	12.81 $\pm$ 0.79/ 12.90 (11.10-14.80)	12.61 $\pm$ 1.06/ 12.85 (10.10-14.10)	12.60 $\pm$ 0.96/ 12.60 (10.40-14.60)	.626
Iron levels (μ g/dL)	46.75 $\pm$ 18.98/ 49.00 (18.00-83.00)	62.42 $\pm$ 32.67/ 58.00 (18.00-141.00)	82.06 $\pm$ 51.53/ 77.00 (11.00-232.00)	.030*	91.17 $\pm$ 34.31/ 91.00 (17.00-161.00)	73.33 $\pm$ 41.46/ 71.00 (12.00-199.00)	83.22 $\pm$ 30.31/ 81.50 (41.00-133.00)	.163
Iron binding capacity (μ g/dL)	342.66 $\pm$ 69.15/ 320.00 (283.00-516)	335.52 $\pm$ 81.05/ 321.00 (201.00-575.00)	290.10 $\pm$ 70.89/ 273.00 (182.00-441.00)	.046*	287.55 $\pm$ 55.37/ 270.00 (205.00-387.50)	303.70 $\pm$ 85.59/ 277.00 (207.00-576.00)	285.80 $\pm$ 72.16/ 280.00 (167.00-412.00)	.696
Vitamin B12 levels (pg/mL)	364.16 $\pm$ 175.58/ 312.50 (206.00-763.00)	480.03 $\pm$ 206.00/ 441.00 (228.00-893.00)	426.14 $\pm$ 216.84/360.00 (190.00-927.00)	.096*	448.51 $\pm$ 148.87/ 414.00 (217.00-806.00)	455.16 $\pm$ 162.81/ 425.00 (185.00-896.00)	462.05 $\pm$ 146.41/ 464.00 (216.00-706.00)	.825*
Vitamin D levels (ng/mL)	23.87 $\pm$ 8.50/ 23.62 (12.70-38.50)	25.00 $\pm$ 9.80/ 22.10 (7.52-49.9)	20.40 $\pm$ 7.71/ 20.20 (7.17-33.10)	.326*	24.90 $\pm$ 6.97/ 23.79 (11.90-41.10)	26.89 $\pm$ 17.42/ 24.15 (7.00-96.30)	23.29 $\pm$ 12.35/ 20.05 (9.00-62.00)	.543*

Hemoglobin level below 10.5 g/dL at 0.5-6 years of age was considered anemia. Iron deficiency <30 μ g/dL, vitamin B12 level <300 pg/mL was considered as deficiency, and 300-900 pg/mL as normal. 25 OH vitamin D level <5 ng/mL was considered as severe deficiency, 5-15 ng/mL as moderate deficiency, 16-20 ng/mL as insufficiency, and 21-100 ng/mL as adequate.

Results were presented as mean $\pm$ SD/median (minimum-maximum).

*Kruskal-Wallis test was performed, otherwise, one-way ANOVA test was used. The mean difference is significant at the <.05 level.

written in the automation system. Weaknesses include the fact that ferritin levels were not included in the study.

Strengths of the study: The comparison of iron, vitamin B12, and vitamin D levels of children with isolated speech delay or speech impairment and healthy control group children is a strength. The comparison of vitamin, iron, and hemoglobin values according to age groups within each group is a strength. Raising awareness about vitamin and iron deficiency in children with isolated speech delay or speech impairment is a strength.

Hemoglobin, iron, vitamin B12, and vitamin D levels in children with speech delay were compared with normal healthy children. The mean iron level was lower in children with speech delay than in the control group. Iron deficiency was most commonly seen between 18 and 24 months in patients with speech delay. Low iron levels may lead to speech delay or speech disorders. Vitamin B12 deficiency was more frequent in children with speech delay than in the control group. Vitamin B12 deficiency may cause speech delay or speech disorders. It is important to see whether there is iron deficiency and B12 deficiency in speech delay and to treat it if there is a deficiency.

Ethics Committee Approval: Ethics committee approval was received from the ethics committee of the clinical research ethics committee of Erzincan Binali Yıldırım University (Approval no: 04/04, Date: 30, April 2019).

Data Availability Statement: The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Informed Consent: N/A.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – İ.S.K-İ.D., C.M.; Design – İ.S.K-İ.D., C.M.; Supervision – İ.S.K-İ.D., C.M.; Fundings – İ.S.K-İ.D., C.M.; Materials – İ.S.K-İ.D., C.M.; Data Collection or Processing – İ.S.K-İ.D., C.M.; Analysis or Interpretation – İ.S.K-İ.D., C.M.; Literature Search – İ.S.K.; Writing – İ.S.K.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support. Due to the retrospective nature of the study consent was not obtained.

References

- Onur H, Rahmanali Onur A, Aslan Ö. The relationship between nutrition and micronutrients in healthy Turkish infants and young children. *Arch Pediatr*. 2024;31(1):15-19. [\[CrossRef\]](#)
- Esnafoglu E. Serum folate, vitamin B12, homocysteine and vitamin D levels in children with specific learning disorder. *Bozok Med J*. 2018;8(3):59-64.
- Karanvir D, Garg D, Sharma S, Pandey S. Left-hand motor stereotypy in vitamin B12 deficiency: expanding the spectrum of infantile tremor syndrome. *Ann Indian Acad Neurol*. 2020;23(3):389-390. [\[CrossRef\]](#)
- Sahu P, Thippeswamy H, Chaturvedi SK. Neuropsychiatric manifestations in vitamin B12 deficiency. *Vitam Horm*. 2022;119:457-470. [\[CrossRef\]](#)
- Rihal V, Khan H, Kaur A, Singh TG, Abdel-Daim MM. Therapeutic and mechanistic intervention of vitamin D in neuropsychiatric disorders. *Psychiatry Res*. 2022;317:114782. [\[CrossRef\]](#)
- East P, Doom JR, Blanco E, Burrows R, Lozoff B, Gahagan S. Iron deficiency in infancy and neurocognitive and educational outcomes in young adulthood. *Dev Psychol*. 2021;57(6):962-975. [\[CrossRef\]](#)
- Kardaş B, Kardaş Ö, Erermiş HS. Prognosis, prognostic factors and the effect of early treatment in speech (communication) disorders. *Turk Clin Child Psychiatry-Spec Top*. 2019;5(1):46-52.
- Grabowski J, Goldin A, Arthur LG, et al. The effects of early anesthesia on neurodevelopment: a systematic review. *J Pediatr Surg*. 2021;56(5):851-861. [\[CrossRef\]](#)

9. Rice ML. Causal pathways for specific language impairment: lessons from studies of twins. *J Speech Lang Hear Res.* 2020;63(10):3224-3235. [\[CrossRef\]](#)
10. Amanda M, Brandow BRB, Scott JP. Hematology. In: Karen J, Marcandante RMK, Schuh AM, eds. *Nelson Essentials of Pediatrics*. 9th ed. Philadelphia: Elsevier; 2023:581-607.
11. Topal İ, Mertoğlu C, Arslan YK, Gümüş A, Kara İS, Peker N. Evaluation of vitamin D levels of children according to age, gender and seasons at Erzincan field. *Firat Med J.* 2018;23(4):168-172.
12. Kara İS, Peker NA, Dolgun İ, Mertoğlu C. Vitamin B12 level in children. *J Curr Pediatr.* 2023;21(2).
13. Witelson SF, Nowakowski RS. Left out axons make men right: a hypothesis for the origin of handedness and functional asymmetry. *Neuropsychologia.* 1991;29(4):327-333. [\[CrossRef\]](#)
14. Alzahrani LD, Aldharman SS, Almuzaini AS, et al. Prevalence and risk factors of speech delay in children less than seven years old in Saudi Arabia. *Cureus.* 2023;15(11):e48567. [\[CrossRef\]](#)
15. Sunderajan T, Kanhere SV. Speech and Language delay in children: prevalence and risk factors. *J Fam Med Prim Care.* 2019;8(5):1642-1646. [\[CrossRef\]](#)
16. İnce H, Say GN, Başaran A, Akoğlu SC, Bekaroğlu A, Taşdemir HA. Examining the factors playing a role in the etiology of speech retardation from the perspective of child neurology. *Turk J Pediatr Dis.* 2022;16:264-269.
17. Rice ML, Hoffman L. Predicting vocabulary growth in children with and without specific language impairment: a longitudinal study from 2;6 to 21 years of age. *J Speech Lang Hear Res.* 2015;58(2):345-359. [\[CrossRef\]](#)
18. Yue T, Zhang Q, Li G, Qin H. Global burden of nutritional deficiencies among children under 5 years of age from 2010 to 2019. *Nutrients.* 2022;14(13):2685. [\[CrossRef\]](#)
19. Ekemen C, Örnek Z, Karacı M, Ekemen A. Evaluation of prevalence of iron, zinc and vitamin A deficiency in school-age children. *Turk J Pediatr Dis.* 2019;13(3):154-159.
20. Pivina L, Semenova Y, Doşa MD, Dauletyarova M, Björklund G. Iron deficiency, cognitive functions, and neurobehavioral disorders in children. *J Mol Neurosci.* 2019;68(1):1-10. [\[CrossRef\]](#)
21. Heland S, Fields N, Ellery SJ, Fahey M, Palmer KR. The role of nutrients in human neurodevelopment and their potential to prevent neurodevelopmental adversity. *Front Nutr.* 2022;9:992120. [\[CrossRef\]](#)
22. Ersoy M, Murat M, Yılmaz S. Evaluation of metabolic and nutritional status of children with autism spectrum disorders: results of a Single Center in turkey. *Med J Bakirkoy.* 2020;16(3):231-239. [\[CrossRef\]](#)
23. Yule S, Wanik J, Holm EM, et al. Nutritional deficiency disease secondary to ARFID symptoms associated with autism and the broad autism phenotype: a qualitative systematic review of case reports and case series. *J Acad Nutr Diet.* 2021;121(3):467-492. [\[CrossRef\]](#)
24. Hope S, Naerland T, Høiland AL, et al. Higher vitamin B12 levels in neurodevelopmental disorders than in healthy controls and schizophrenia: a comparison among participants between 2 and 53 years. *FASEB J.* 2020;34(6):8114-8124. [\[CrossRef\]](#)