

Patterns of Developmental Delay in Children with Autism Spectrum Disorder: A Perspective from a Developing Country

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ABSTRACT

Background: Autism Spectrum Disorder is a developmental disorder characterized by difficulties in social interaction, initiating conversations, delay in language skills, play skills, and stereotypic behaviours. Children with severe developmental delays and those with global developmental delays need to be identified as they may have long-term problems and disabilities.

Materials & Methods: All children below the age of 5 years coming first time for assessment of ASD and diagnosed using ADI-R and ADOS-2 were included in the study. A total of 334 children met the criterion. All children having performance deficits below 2SD on age-appropriate mean were considered as having developmental delays. Those having delays in two or more domains were labelled as having global developmental delays. Detailed clinical and developmental assessment was performed. Data was entered and analyzed via SPSS v26.

Results: Mean age of children at the time of presentation was 3.6±1.10 years with male to female ratio of 3.5:1. According to developmental assessment using Schedule for growing Scales II, the most affected area was speech and language (51.5%) followed by cognitive skills (50.7%), social interactive skills (49.9%), visual skills (46.9%), hearing and language skills, (38.3%), self-care social skills (26.2%), manipulative skills (13.5%) and gross motor skills (0.4%). Global Developmental Delay was found to be present in half of the children for which there was no other possible explanation.

Conclusion: Most of the children with Autism Spectrum Disorder had developmental delays of some sort. Therefore, every child with Autism Spectrum Disorder must be evaluated for Developmental Delay and supported.

Keywords:

Autism Spectrum Disorder, Developmental Milestones, Global Developmental Delay, Speech Delay, Social Skills, Cognitive delay

Authors' Contribution:

^{1,2}Conception; Literature research; manuscript design and drafting; ¹Critical analysis and manuscript review; ²Data analysis; Manuscript Editing.

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Article info:

Received: November 21, 2021
Accepted: August 4, 2023

Cite this article. Waris R, Raza H, Riaz R. Patterns of Developmental Delay in Children with Autism Spectrum Disorder: A Perspective from a Developing Country. J Islamabad Med Dental Coll. 2023; 12(3): 171-178. DOI: <https://doi.org/10.35787/jimdc.v12i3.814>

Funding Source: Nil

Conflict of interest: Nil

Introduction

Autism Spectrum Disorder is a developmental disorder characterized by difficulties in social interaction, initiating conversations, delay in language skills, play skills, and stereotypic

behaviours including repetition, hypersensitivity or hyposensitivity to sensory experiences. Some may show hyperactivity and aggression.¹ Children and individuals with Autism Spectrum Disorder also face difficulties in regulating emotions and have

decreased EQ (emotional quotient).² Fifty percent of these individuals show intellectual disabilities and have lower IQ (Intellectual Quotient) levels than their peers.³ Till now aetiology of autism is poorly understood. Both environmental and genetic factors are thought to play a role in its development. Other causative factors are also thought to play a role though evidence is not established yet. Co-morbidities that can occur with Autism include seizures, immune disorders, Attention Deficit Hyperactivity Disorder, obsessive-compulsive disorder, Learning Disabilities, Dyslexia, and other behavioral disorders.⁴

According to WHO, 1 in 160 children has Autism Spectrum Disorder.⁵ In America, according to the latest study, 1 in 36 children are affected.⁶ In Pakistan, the prevalence of ASD is not known due to a lack of awareness. Though 19 in 1000 children have learning disabilities and 16 in 1000 have severe mental retardation. Due to lack of knowledge and trained professionals for developmental disorders, most of the children are misdiagnosed. Most of the general public consider it as mental illness and there is a huge social stigma attached to such diseases. Subsequently, parents of such children avoid contact with healthcare professionals or seek medical attention very late. However, in the urban population, the trend is changing.⁷ Autism generally come into notice at pre-school when a child is unable to cope socially with other children although specific criterion has been developed to diagnose it at an early age. The absence of babbling, and lack of social smile till 1 year is one of the prominent signs of ASD that must alert parents.⁸

Many scales have been developed to diagnose ASD. However most commonly used tool for its diagnosis is the Autism Diagnosis Observation Schedule (ADOS).⁹ It is a standardized semi-structured evaluation of social interaction, imaginative play, communication skills, and behaviors. ADOS-2 was released in 2012, has five modules, and is currently considered as gold standard, Toddler Module is for

children from 13 to 30 months without speech, Module 1 is for children aged 31 months and those older without speech, Module 2 is for children with speech but not fluent, Module 3 for children and adolescents with fluent speech, Module 4 for adults with fluent speech.¹⁰

Children with ASD have different developmental courses than other children. They have delays in some domains but achieve some milestones earlier. However, it is different from general developmental delay and should be differentiated from it as both require different management though both conditions may co-exist. Developmental delay typically implies to delay in the achievement of developmental milestones and can be graded into mild, moderate, and severe. Global developmental delay refers to intellectual delays with impairment in two or more adaptive skills.¹¹ Children with developmental delays have the risk of lifelong intellectual and physical disabilities. Early diagnosis and intervention can improve the outcome and help children achieve their potential. Studies have shown that children with Autism have experienced mild developmental delays in motor and language skills and deficits in social skills. However, these delays are more common in children below 3 years and gradually improve with age.¹² It is also reported that 30 to 60 percent of children with ASD also suffer from intellectual disability.¹³

Developmental delays are usually diagnosed via detailed clinical and developmental assessment to check developmental status in all domains i.e. locomotor skills, manipulative skills, visual skills, hearing and language skills, speech and language skills, social interactive skills, self-care social skills and cognitive skills.¹⁴ Schedule for Growing Skills 11(SGS II) is one of the scales to assess developmental status in children less than 6 years old.¹⁵ Other investigations are usually carried out to diagnose the underlying genetic or structural pathologies.¹⁶

For treating Autism different interventional strategies related to individual symptoms improve the condition and ability to participate in society. Most of the strategies include occupational therapy, speech therapy, and social skills training. No medications are usually prescribed for core symptoms of ASD children however when patients have co-morbidities like seizure, behavioural issues, suicidal thoughts, or other conditions medications are considered. ¹⁷The current study focuses on the presence of developmental delay and its patterns in children affected with ASD in Pakistan.

Methodology

This descriptive study was conducted at Children's Hospital, Pakistan Institute of Medical Sciences from May 2017 to April 2020. All children ≤ 5 years coming first time for assessment of ASD and diagnosed with it on ADI-R and ADOS-2 were included in the study. A total of 334 children met the criterion. All children having performance deficits below 2SD on age-appropriate mean in motor skills, manipulative skills, visual skills, speech and language skills, hearing and language skills, social interaction skills, self-care social skills, and cognitive skills were considered as having developmental delay classified by using SGS-II. Those having delays in two or more domains were labeled as having global developmental delays. A detailed clinical assessment was performed, and past medical and family history was taken. Family history was considered positive if any of the relatives had any kind of developmental delay not necessarily ASD. Data were entered and analyzed in SPSS v26. Descriptive statistics were performed on qualitative data, dispersion in data was analyzed via mean and standard deviation measurement, relative risk, and Odd's Ratio was applied for risk assessment.

Results

The mean age of children at the time of presentation was 3.6 ± 1.10 years. The majority (n=259, 77.5%) of the patients were males with a male-to-female ratio of 3.5:1. Twenty-six percent (n=89) of the cases had positive family history (Figure-1).

A most common complaint was speech delay followed by repetitive behaviour, behavioural issues, poor social interaction, non-responsiveness, lack of imaginative play and sensory issues (Figure-2). The mean age of neck holding was 3.87 ± 2.0 months, starting sitting was 7.9 ± 2.56 months, crawling was 10.88 ± 4.3 months, walking was 15.6 ± 6.1 months, social smile was 3.71 ± 2.9 months, vocalization was 8.43 ± 7.6 months and babbling was 10.68 ± 3.55 months. The majority of the children had both weight (79%) and OFC (94%) below 25th percentile. Few children (n=29, 8.68%) presented with co-morbidities. Most common were epileptic seizures (n=14) followed by ADHD (n=6), Deafness (n=3), Down's Syndrome (n=1), Tuberous Sclerosis (n=1), Factor 5 deficiency (n=1), Microcephaly (n=1), Albinism (n=1) and Hypothyroidism (n=1).

According to the SGS-II scale most affected area was speech and language (51.5%) followed by, cognitive skills (50.7%), social interactive skills (49.9%), visual skills (46.9%), hearing and language skills, (38.3%), self-care social skills (26.2%), manipulative skills (13.5%) and gross motor skills (0.4%) (Figure-3).

Detailed analysis showed females to have more delay in all domains i.e. gross motor skills (1.62%), manipulative skills (16.13%), visual skills (51.6%), speech and language (62.91%), hearing and language (50%), interactive social skills (56.46%) cognitive skills (61.2%) and self-care social skills (20.97%) compared to male with gross-motor skills (0%), manipulative skills (6.04%), visual skills (45.46%), speech and language (48.2%), hearing and language (36.8%), interactive social skills (48.2%), cognitive skills (48.6%) and self-care social skills (11.4%) (Figure-4). A significant difference was

found between the female gender and specific skills (Table 1).

Toddlers had more delay in visual skills (57.04%), hearing and language skills (38.92), speech and language skills (54.36%), cognitive skills (55.03%) compared to pre-schoolers with manipulative skills (12.03%), visual skills (44.36%), hearing and language skills (37.59), speech and language skills (48.12%), cognitive skills (44.36%). Pre-schoolers had more delay in manipulative skills (12.03%) and gross motor skills (0.75%) compared to toddlers with manipulative skills (6.09%) and gross motor skills (0%). However, no significant difference was found between both age groups, and specific skills (Table-2).

Global Developmental Delay was found to be present in half (n=167, 50.0%) of the children. Toddlers had more GDD than pre-schoolers (Figure 4). Among factors studied for the risk of global developmental delay only the presence of co-morbid conditions was found to be associated. Relative risk of GDD was found to be significantly increased if child presented with sensory symptoms and non-responsiveness (Table-3). GDD was found to be more common in toddlers in comparison to pre-schoolers. Gender was found to be independent of GDD (Figure 4).

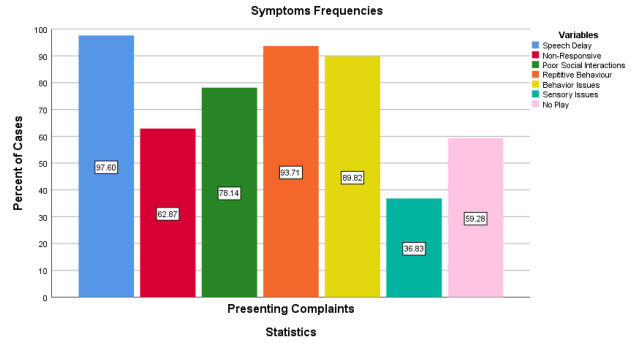


Figure 2: Presenting complaints of the children with Autism Spectrum Disorder

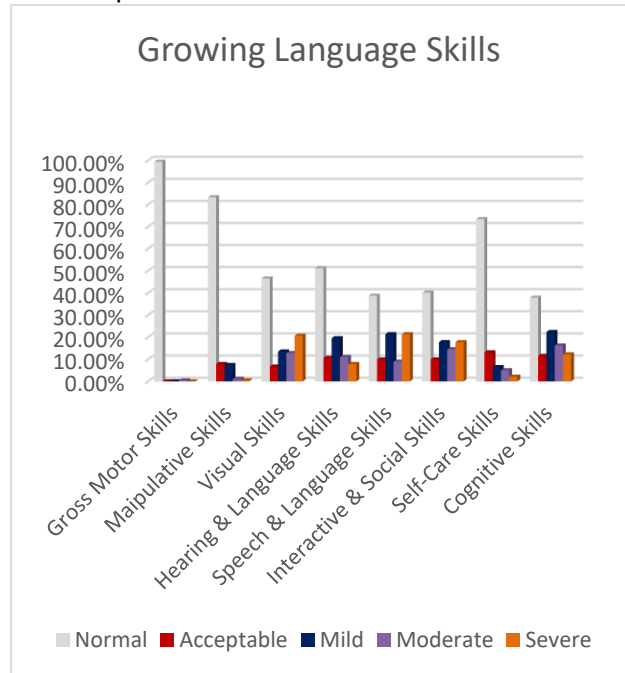


Figure 3: SGS score of the children with Autism Spectrum Disorder

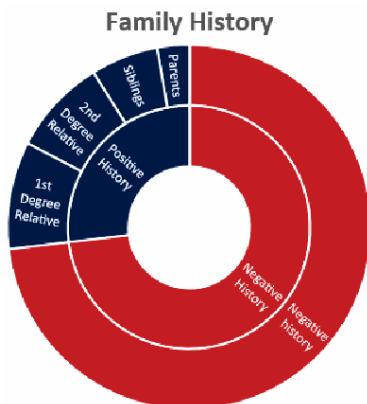


Figure-1: Family History of the Children with Autism Spectrum Disorder

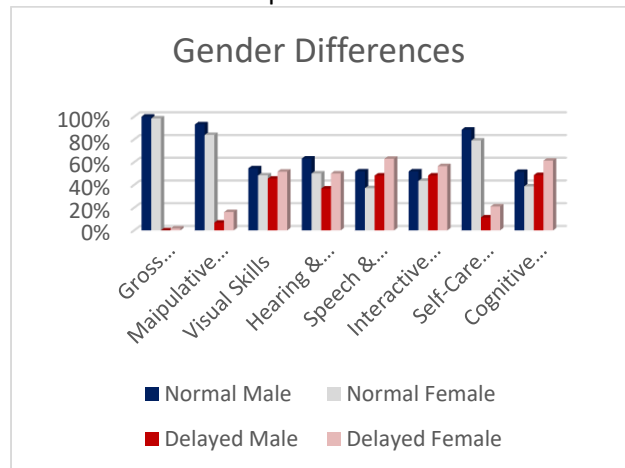


Figure-4- Gender differences and Developmental Delays in Autistic Children

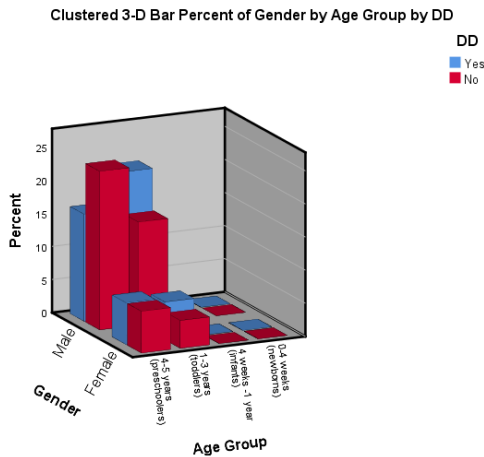


Figure-5: Age versus Gender wise distribution of Global Developmental Delay in Children with Autism Spectrum Disorder

	Odd's Ratio	Relative Risk	P-Value
Gross Motor Skills	10.7	10.2	0.14
Manipulative Skills	2.75	2.36	0.001
Visual Skills	1.28	1.18	0.3
Hearing Skills	1.48	1.3	0.1
Speech Skills	1.5	1.2	0.2
Social Skills	1.91	1.8	0.002
Self-Care Skills	2.06	1.7	0.005
Cognitive Skills	1.69	1.22	0.007

*P-Value <0.05 was considered significant.

	Odd's Ratio	Relative Risk	P-Value
Gross Motor Skills	0.2	0.1	0.4
Manipulative Skills	0.5	0.4	0.08
Visual Skills	2.54	1.66	0.001
Hearing Skills	1.04	1.06	0.8
Speech Skills	1.54	1.24	0.07
Social Skills	0.8	0.7	0.2
Self-Care Skills	0.8	0.7	0.2
Cognitive Skills	1.5	1.24	0.07

*P-Value <0.05 was considered significant.

	Odd's Ratio	Relative Risk	P-Value
Factors			
Co-Morbid	1.88	1.35	0.05
Family History	1.2	1.1	0.63
Weight above the 75 th percentile	0.8	0.7	0.2
OFC at birth below the 25 th percentile	0.86	0.7	0.2
Female Gender	1.14	1.08	0.5
Toddlers	1.8	1.6	0.001
Symptoms:			
Speech Delay	1	1	1
Non-Responsive	3.24	1.5	0.001
Poor Social Outcome	3.48	1.29	0.001
Sensory Loss	2.81	1.9	0.001
Repetitive Behaviour	3.43	1.22	0.001
Behavioral Issues	1.32	1.02	0.3

*P-Value <0.05 was considered significant.

Discussion

The first signs of ASD usually appear by the end of the first year as lack of social smile, lack of vocalization, and babbling which normal children start at 6-8 months. The absence of meaningful words till 16 months is also an early warning sign. However, at this stage, it is difficult to differentiate it from other disorders. Studies point out some distinctive features that can help in differentiating ASD from other Disorders at this stage too.¹⁸ A stable diagnosis of ASD by health professional is usually made in toddler age. However, most of the children present at age of 4 when they start

preschool as most of the parents get concerned when their child does not perform well or interact with peers at school.¹⁹ The mean age of presentation in this study was also found to be 3.6 years with male preponderance. Autism is considered to affect males more than females due to genetics underlying its causation.²⁰

Children with Autism Spectrum Disorder usually have different developmental trajectories than other children. They suffer from delays in a few skills, especially in language and social skills. While some milestones are achieved early. Most of the patients in the current study had complaints of speech delay, repetitive behaviours and poor social interaction. Upon SGS 11 scoring speech delay was the most compromised skill with 20% of cases having severe impediment i.e. below 3 to 5 years of their age in speech and language skills. Reinhartsen et al found that children with ASD have more severe impairment in receptive language skills than expressive skills when compared with children with other developmental delays. He also found such children have more delay in their non-verbal cognitive skills²¹ This was in concord with our study where cognitive skill was the second most compromised skill. ASD children with language delay (LD) were found to have poorer social interaction compared to those without language delay. Also, language delay leads to intellectual delay if early intervention is not performed. Delehanty et al performed a detailed evaluation on toddlers with ASD, ASD with GDD, GDD alone, ASD and LD and LD alone, and controls. He found that ASD children without GDD and LD had developmental abilities comparable to controls. However, those with LD had more intellectual disabilities and delayed social outcomes. Children with ASD with GDD scored significantly lower than children having alone GDD. Therefore, special attention needs to be given to children having ASD with GDD as they have a high risk of developing long-term disabilities.¹⁹

In children less than 1 year, autism is diagnosed due to delayed achievement of speech and milestones, which include delayed babbling, vocalization, lack of social smile, and delayed crawling and walking (8) . However, in the current study children achieved social smiles, babbling, and vocalization in normal time walking was delayed. This was in concord with Reindal et al. who found the mean age of walking in children with ASD to be 15 months.²²

Gender differences and their association with developmental delays in children with ASD have shown conflicting results. Few studies reported no relationship between gender and developmental delays.²³ In the current study, females scored much less than males in all domains and had significant deficits. A study by Zen et al. also showed females to have more emotional problems, associated with social behavior and developmental delays.²⁴

Another major finding in this study was the presence of global developmental delay in half of the children with ASD. Worldwide, it has a prevalence of 1-5% and in ASD children it is around 32%.²⁵ In Pakistan the rate of GDD is very high reaching up to 15%. This high incidence is attributed to malnutrition and maternal depression.²⁶ In the current study, the prevalence in children with ASD was noted to be 50%. This might be due to the high prevalence of GDD in the country.

Among factors studied that might risk the risk of developmental delay in ASD children, only co-morbidities were found to increase the risk of developmental delay. Studies have shown that children with ASD have 13% lower OFC than normal children. Also, low OFC at birth is associated with low IQ levels in ASD children.²⁷ Some studies also predict association between obesity and delayed development in ASD children but this was not found in our study.²⁸ However, in our study, this was insignificant. Among co-morbid conditions, the prevalence of epilepsy in ASD individuals is 25-30% by time of adolescence. The presence of epilepsy is

also found to be associated with increased developmental delay and increased mortality rate in ASD individuals.²⁹ In the current study, 4.19% of the children had epileptic seizures. This low rate might be due to studies not involving school children and adults.

We also studied the symptoms that might alert the physician for developmental delay assessment, however almost all symptoms that are commonly present in autism were also present in developmental delay. Therefore, we recommend a complete evaluation of every ASD child as they might have associated developmental delays.

Conclusion

Most of the children with Autism Spectrum Disorder did not achieve developmental milestones and suffered from developmental delays. If not diagnosed timely may increase the lifetime risk of long-term disabilities therefore; attention must be given in this domain. Every ASD child must be evaluated for Developmental Delay and treated accordingly as early intervention can improve the outcome and prognosis.

REFERENCES

1. Hodges H, Fealko C, Soares N. Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. *Transl Pediatr.* 2020;9(Suppl 1): S55–65.
2. Trevisan DA, Abel EA, Brackett MA, McPartland JC. Considerations About How Emotional Intelligence can be Enhanced in Children With Autism Spectrum Disorder. *Front Educ (Lausanne).* 2021; 6:639736.
3. Duvall SW, Huang L, Alison S, Hill P, Myers J, Fombonne E. No Sex Differences in Cognitive Ability in Young Children with Autism Spectrum Disorder. *J Autism Dev Disord.* 2020 May;50(5):1770-1785.
4. Almandil NB, Alkuroud DN, AbdulAzeez S, AlSulaiman A, Elaissari A, Borgio JF. Environmental and Genetic Factors in Autism Spectrum Disorders: Special Emphasis on Data from Arabian Studies. *Int J Environ Res Public Health.* 2019 Feb 23;16(4):658.
5. World Health Organization. *Autism Spectrum Disorders.* 2019.
6. Walensky RP, Bunnell R, Kent CK, Gottardy AJ, Leahy MA, Martinroe JC, et al. Morbidity and Mortality Weekly Report Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years-Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020 Surveillance Summaries Centers for Disease Control and Prevention MMWR Editorial and Production Staff (Serials) MMWR Editorial Board. 2020.
7. Furrugh J, Anjum G. Coping with autism spectrum disorder (ASD) in Pakistan: A phenomenology of mothers who have children with ASD. *Cogent Psychol.* 2020;7(1): 1728108.
8. Ivanov I, Pacheva I, Timova E, Iordanova R, Galabova F, Gaberova K, et al. The route to autism spectrum diagnosis in pediatric practice in Bulgaria. *Diagnostics.* 2021;11(1):106.
9. Cecilia M, Vásquez M, Hernández-chávez M. Autism spectrum disorder : Clinical diagnosis and ADOS Test Trastorno del espectro autista : Diagnóstico clínico y test ADOS. 2019;90(5):485–91.
10. Janvier D, Choi YB, Klein C, Lord C, Kim SH. Brief Report: Examining Test-Retest Reliability of the Autism Diagnostic Observation Schedule (ADOS-2) Calibrated Severity Scores (CSS). *J Autism Dev Disord.* 2022;52(3):1388-1394.
11. Mitchell C, Rt R, Rahko PS, Blauwet LA, Canaday B, Finstuen JA, et al. Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults : Recommendations from the American Society of Echocardiography. *Journal of the American Society of Echocardiography.* 2018;32(1):1-64.
12. Mohd Nordin A, Ismail J, Kamal Nor N. Motor Development in Children With Autism Spectrum Disorder. *Front Pediatr.* 2021; 15(9):598276.
13. Wolff N, Stroth S, Kamp-Becker I, Roepke S, Roessner V. Autism Spectrum Disorder and IQ – A Complex Interplay. *Front Psychiatry.* 2022; 18(13):856084.
14. Brown KA, Parikh S, Patel DR. Understanding basic concepts of developmental diagnosis in children. Vol. 9, *Translational Pediatrics.* 2020; 9(Suppl 1):S9-S22.
15. Cibralic S, Hawker P, Khan F, Lucien A, Mendoza Diaz A, Woolfenden S, et al. Developmental screening tools for identification of children with developmental difficulties in high-income countries: a systematic review. *Frontiers in Child and Adolescent Psychiatry.* 2023;2:1074004.
16. Mithyantha R, Kneen R, McCann E, Gladstone M. Current evidence-based recommendations on investigating children with global developmental delay. *Arch Dis Child.* 2017;102(11):1071–6.

17. Silveira-Zaldivar T, Özerk G, Özerk K. Developing social skills and social competence in children with autism. *International Electronic Journal of Elementary Education*. 2020;13(3):341–63.
18. De Giacomo A, Craig F, Palermo G, Coppola A, Margari M, Campanozzi S, et al. Differential diagnosis in children with autistic symptoms and subthreshold ADOS total score: An observational study. *Neuropsychiatr Dis Treat*. 2021;17:2163-2172.
19. Delehanty AD, Stronach S, Slate E, Wetherby AM. Verbal and nonverbal outcomes of toddlers with and without autism spectrum disorder , language delay , and global developmental delay. 2018; 3.
20. Benjamin Zablotsky, Lindsey I. Black SJB. Summary of Changes Made to the Bright Futures/AAP Recommendations for Preventive Pediatric Health Care (Periodicity Schedule). NCHS data brief. 2017.
21. Reinhartsen DB, Tapia AL, Watson L, Crais E, Bradley C, Fairchild J, et al. Expressive Dominant Versus Receptive Dominant Language Patterns in Young Children: Findings from the Study to Explore Early Development. *J Autism Dev Disord*. 2019; 49:2447–2460.
22. Reindal L, Nærland T, Weidle B, Lydersen S, Andreassen OA, Sund AM. Age of First Walking and Associations with Symptom Severity in Children with Suspected or Diagnosed Autism Spectrum Disorder. *J Autism Dev Disord*. 2020;50(9):3216-3232. ;
23. Sturrock A, Marsden A, Adams C, Freed J. Observational and Reported Measures of Language and Pragmatics in Young People with Autism: A Comparison of Respondent Data and Gender Profiles. *J Autism Dev Disord*. 2020; 50(8):1-19.
24. Zen Y, Chiyonobu T, Yuge M, Yokota I, Morimoto M, Teramukai S, et al. Gender differences in occurrence of behavioral and emotional problems at the lower grades of elementary school: Association with developmental and behavioral characteristics at 5 years. *Brain Dev*. 2019;41(9).
25. Christensen DL, Baio J, Van Naarden Braun K, Bilder D, Charles J, Constantino JN, et al. Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years--Autism and Developmental Disabilities Monitoring Network, 11 Sites. *MMWR Surveill Summ*. 2016 Apr;65(3):1–23.
26. Khan MA, Owais SS, Blacklock C, Anil S, Ishaq S, Maqbool S, et al. Delivering integrated child development care in Pakistan: protocol for a clustered randomised trial. *BJGP Open*. 2017 Jan;1(1):bjgpopen17X100677.
27. Blanken LME, Dass A, Alvares G, van der Ende J, Schoemaker NK, El Marroun H, et al. A prospective study of fetal head growth, autistic traits and autism spectrum disorder. *Autism Research*. 2018 Apr 1;11(4):602–12.
28. Cheng W, Sun Z, Cai K, Wu J, Dong X, Liu Z, et al. Relationship between Overweight/Obesity and Social Communication in Autism Spectrum Disorder Children: Mediating Effect of Gray Matter Volume. *Brain Sci*. 2023 Feb 1;13(2):180.
29. Tye C, Runicles AK, Whitehouse AJO, Alvares GA. Characterizing the Interplay Between Autism Spectrum Disorder and Comorbid Medical Conditions: An Integrative Review. *Front Psychiatry*. 2019;23(9):751.