

ASSOCIATION OF MOTOR DEVELOPMENTAL DELAY IN CHILDREN WITH AUTISM: A RETROSPECTIVE COHORT STUDY FROM A TERTIARY CARE CENTRE.

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ABSTRACT

Purpose

For comparing children with autism spectrum disorder usually growing children's gross and fine motor profiles, this research was done. The study also evaluated whether the motor delay increased in severity with age.

Methods

This study compared children without autism spectrum disorders, the motor growth of those who usually develop, using data from children aged 12 to 60 months. The Schedule of Growing Skills II was utilized to evaluate their profile for growth. Utilizing statistical methods, the developmental profiles of the groups were examined.

Results

The study included a total of 50 children, comprising 29 children with autism spectrum disorder (ASD) and 21 typically developing (TD) children. Significant delays were observed in the ASD group, with 83.7% of these children exhibiting cognitive delays. Fine motor delays were present in 38.5% of children with ASD, and gross motor delays were noted in 6.7%. In contrast, none of the TD children exhibited such delays. The data further indicated that motor delays in children with ASD worsened with age, particularly in the older cohort (37-60 months), with 100% of gross motor delays and a higher percentage of fine motor delays in this age group. Statistical analysis using Fisher's exact test confirmed significant differences between the ASD and TD groups across all developmental domains assessed ($p < 0.01$). The findings highlight the necessity of early intervention to address motor delays in children with ASD, emphasizing the need for comprehensive developmental assessments.

Conclusions

Children suffering with ASD exhibit a discernible motor delay in contrast to children with normal development, and this delay only gets more severe as they grow older, making it imperative to assess their motor growth. Services for early intervention may be provided to maximize growth results in the event that motor delay is identified early.

Keywords: Autism Spectrum Disorder; Motor Developmental Delay; Developmental Physiotherapy

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INTRODUCTION

A condition known as autism spectrum disorder (ASD) is defined by having persistent speech problems, nonverbal interaction with others, and recurrent or restrictive behavior (1). One of every 54 children in the US is thought to have an ASD, based on data collected by the Centers in 2016 (2). As of right now, no extensive prevalence studies have been published in Malaysia. In 2006, a feasibility study conducted in medical clinics are run by the Ministry of Health Malaysia (MOH) with children aged 18 to 36 months, using the revised checklist for Autism (M-CHAT),

calculated the frequency of ASD in the country to be approximately 1.6 per 1,000 (3). General motor dysfunction is not one of the primary criteria for diagnosing ASD, although among its traits is social communication impairment (SCI). Nonetheless, current research has shown that some children with ASD also experience motor issues and delays. Up to 80% of children with definitive in general motor loss were reported in studies assessing children ages 3 to 16 utilizing the M-ABC2 Movement Assessment Battery for Children (4, 5). In a comparable manner, the Test revealed that 80% of children diagnosed with ASD had delayed motor growth (6).

In contrast, a more current investigation using information from the Western Australia Register found that, according to the Vineland Adaptive Behavior Scales (7), 35% of children under the age of six who were diagnosed with ASD had motor difficulties. Furthermore, other past research has used the Mullen Scales of Early Learning (MSEL) to look at the developmental paths of toddlers with ASD. Similar findings are reported in these studies, indicating that children with ASD typically experience growth delays in all domains, including both primary and secondary gross motor abilities (8, 9).

Others, however, did not come to the same conclusion. For instance, in 2015, Ozonoff et al. discovered that delays in motor growth occurred among children with ASD as well as with children with various growth delays (DD), suggesting that ASD alone did not seem to cause motor delay in these kids (10, 11).

The research attempts to clarify this topic further, particularly in relation to Asian populations. In contrast to children without TD, it is believed that children with ASD had been more inclined to experience delays in their gross and fine motor skills. More specialized domains of gross and fine motor growth, including walking, balance—both static and dynamic—praxis, and hand-eye coordination were not examined in the research.

This study aims to compare the gross and fine motor developmental profiles of children with ASD to those of typically developing children and to evaluate whether the severity of motor delays increases with age.

METHODS

Study Design

Retrospective cohort study

Study Setting

The study was conducted at Department of Pediatrics, Government Medical College, Ongole, India.

Participants

50 children in all were selected for the investigation based on their age and the date for their clinic visit from the database. Following a review of the medical files, 104 patients—once those who matched the study's exclusion requirements and those with incomplete data were eliminated—were determined to be suitable for evaluation.

Inclusion criteria

Children aged 12 to 60 months with ASD or typical development, excluding those with neurological disorders, genetic disorders, significant medical conditions affecting motor skills, or sensory impairments.

Exclusion Criteria

The following conditions had to be met in order to be excluded: (a) children with focal neurological results; (b) verified or believed ASD or genetic disorders possible additional causes; (c) a major prior medical experience that could have contributed to delays in development brought on by conditions like head injuries, neonatal low blood sugar, or hypoxic ischemic encephalopathy. (d) Seizures, (e) Severe blindness or deafness, (f) Any medical condition that might affect a person's ability to acquire motor skills. To lessen the possibility of additional confounding variables influencing the children's motor skills, these were eliminated. The children who were aware of concurrent illnesses, like genetic disorders, focal neurological results, and seizures, were also excluded because it was believed that brain defects that may be linked to these diseases could lead to delay in large or fine motor growth. The goal was to find out if an evaluation of ASD by itself, devoid of these concurrent medical conditions, correlated with motor delay. This could suggest a different route than neurological disorders that accompany these co-morbidities that influence the neurodevelopmental progress in ASD. It makes sense to avoid children with hearing impairments as well because they may be more dependent on visual signals and experience variations in the growth of motor skills. Children with visual impairments may experience delays in motor growth due to a lack of visual stimulation.

Bias

There was a chance that bias would arise when the study first started, but it was avoided by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

Study Size

The TD data on kids was gathered through sampling for convenience. Seventy-four TD kids in all were enlisted. These included any healthy kids in the wider pediatric clinic waiting area, kids who freely came in for evaluation, and kids who scheduled an additional visit at HCTM's pediatric office for minor ailments like mild anemia or noncomplicated asthma. The parents were asked to complete a survey to screen for potential developmental

delays and pertinent medical histories. For the study, only young patients without noteworthy medical histories or ongoing developmental issues were enrolled.

Data Collection and Procedure

Every child in the clinic saw a pediatrician who specialized in diagnosing ASD, or a pediatric medical officer working under the direction of the attending pediatrician. With further advice from additional members of the developmental team, Children who had an ambiguous evaluation were directed to a dedicated clinic.

Statistical analysis

A uniformed history-taking sheet was used to record medical information, and if a child met the diagnostic criteria for ASD as outlined in the Diagnostic and Statistical Manual of Mental Disorder, version 5 (DSM-5), a diagnosis of ASD was made. SPSS version 20 was used for statistical analysis. It was thought that a p-value of 0.5 indicated

significance. With a small sample size, the connection among two categorized variables was examined using the Fisher exact test.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULTS

There were 50 children in this study, 29 of them were in the ASD group and 21 were in the TD group. The ASD group had a slightly younger mean age at which SGS II was given than the TD group, and ASD group included 88.6% more male children than female children. When contrasted with children with ASD, a greater percentage of TD children belonged to the Malay ethnic group. The two categories did not differ in other aspects like maternal age at delivery or parental age. This is displayed in Table 1.

Table 1: Baseline characteristics of ASD and TD children assessed.

	ASD Mean (SD)	TD Mean (SD)
Mother's age	33.5(4.07)	34.0(4.21)
Mother's age at delivery	30.0(5.0)	30.1(4.7)
Father's age	35.5(5.5)	35.6(5.2)
Age SGS II conducted	36.6(8.75)	43.9(10.8)
	n (%)	n (%)
Male	23	11
Female	3	13

According to the findings, children with ASD showed significant delays across all domains in contrast to children with TD, with a high percentage (83.7%) of ASD children exhibiting cognitive delay. Significant delays in fine motor skills (38.5%) and gross motor (6.7%) fine motor skills (38.5%) were also present in a smaller proportion of children

with ASD than in TD children. Although not statistically noteworthy, a small percentage of kids in the TD group in the study had expressive and receptive language delays. Table 2 displays the characteristics of both groups' divergent growth paths.

Table 2: profile of development delay in ASD vs TD

Developmental domains in SGS-II	ASD (n=29)	n (%)	TD (n=21)	n (%)	Fisher's exact test (p-value)
Cognitive					
Developmental delay	24		0		<0.01
No developmental delay	5		21		
Locomotor					
Developmental delay	2		0		0.02
No developmental delay	27		21		
Manipulative					
Developmental delay	11		0		<0.01
No developmental delay	18		21		
Visual					
Developmental delay	13		0		<0.01
No developmental delay	16		21		
Interactive social					
Developmental delay	19		0		<0.01
No developmental delay	10		21		
Self-care social					
Developmental delay	16		0		<0.01
No developmental delay	13		21		
Speech and language					
Developmental delay	27		2		<0.01
No developmental delay	2		19		
Hearing and language					
Developmental delay	26		1		<0.01
No developmental delay	3		20		

Additionally, it was discovered that every ASD child who had a Delay in motor abilities and manipulative skills also had a concurrent cognitive delay. According to the research, every child who tested positive for a substantial gross motor

delay belonged to the older cohort of 37 to 60 months old. In contrast to children in the younger age range, a greater percentage of older children also had fine motor delay. Table 3 presents the findings.

Table 3: Child ASD patients' locomotor and manipulative abilities at 0-36 and 37-60 months

Developmental domain	0-36 months	37-60 months	p-value
Locomotor			
Developmental delay	0	2	0.01
No developmental delay	14	13	
Manipulative			
Developmental delay	3	8	0.03
No developmental delay	11	7	

DISCUSSION

Employing the developmental assessment instrument SGS II, the study aimed to ascertain the characteristics of children's gross and fine motor abilities differed in the CDC UKMMC between children who have ASD and typically developing (TD) children. In contrast to TD children, who did not exhibit any motor development delays, children with ASD showed significant delays in gross as well as fine motor development.

The findings are in line with earlier studies on ASD that have demonstrated that delays in children's fine as well as gross motor abilities from autism spectrum disorders worsen with age, especially those conducted by Landa's group (12). It is not surprising that a subset of kids with ASD would experience delays in gross and fine motor development as well as global developmental delays. In the study, it was not possible to determine whether a motor delay is exclusively linked to ASD or if a concurrent global development delay exacerbates the motor delay. One of the recognized comorbidities of ASD is intellectual impairment, as has long been established (13, 14).

Significant intellectual delay was found in a large percentage of children with ASD in the sample (83.7%, $p < 0.01$), and cognitive delay was present in every child with gross motor delay (100%, $p < 0.01$). Due to the inconsistent nature of these studies, the literature currently in publication is unable to distinguish between the associations between IQ scores and gross motor delay as well as ASD and DD. According to a recent review, motor proficiency deficits can occur at any point in the range, independent of intelligence level (15). More recently, Kaur's research found that IQ is correlated with either gross or fine motor abilities, but not with the severeness of ASD (18).

About one-third of children diagnosed have an intellectual disability in addition to ASD, meaning their IQ is below 70, according to a previous study (16). A significant number of the children in the study also had cognitive delays, which may be related to simultaneous delays in fine and gross motor skills. Regretfully, the research tool did not allow us to test this theory. The correlation between the severity of ASD and motor growth may also be more clearly shown by praxis error (17). Sadly, the instruments that were used in the study prevented us from determining praxis error. Approximately 8% of the screened children in the TD group encountered difficulties with language, even though their parents did not initially report any issues with development. Even though none of these language-delayed kids had

characteristics that would point to autism spectrum disorder, this finding is significant because it draws attention to the hidden issue of children's delays in development, particularly language delays, that parents might not be aware of. The language in the SGS II testing evaluation was recognized delay by examining the child's language use during the evaluation as well as specific questions about Parents were interviewed interview regarding the child's growth in language as indicated by the evaluation.

The sample's language delay prevalence is marginally higher than anticipated; it might not accurately represent the prevalence in the community. According to reports, language delay affects between 2.6 and 6% of people in general (18). Numerous children with TD were the offspring of hospital employees who voluntarily came for evaluation. It is hypothesized that some parents, who did not express any concerns about development in the screening survey, might have arrived for testing in order to have their unexpressed worries about the growth of their kids confirmed or eased.

The study reveals significant delays in gross (6.7%) and fine (38.5%) motor skills in children with autism spectrum disorder (ASD) compared to typically developing (TD) children, with 83.7% exhibiting cognitive delays and every child with a gross motor delay also having a cognitive delay ($p < 0.01$). These findings align with existing research, suggesting a strong correlation between motor and cognitive impairments in ASD.

Generalizability: The generalizability of the study results is limited by the small sample size, single-center setting, and retrospective design, which may not represent the broader population of children with autism spectrum disorder (ASD) and typically developing (TD) children. Additionally, the exclusion of children with significant medical conditions may limit applicability to those with co-occurring conditions.

CONCLUSION

In summary, the research indicates that, in comparison to TD children, Delays in fine as well as gross motor development are more common in children diagnosed with autism spectrum disorder (ASD), and that these delays are more noticeable in older ASD children. SGS II is a screening tool, but it might be helpful in a situation where resources are scarce to evaluate the developmental profile of children with ASD. In order to maximize long-term results, early intervention must be provided upon the identification of developmental delays. Early intervention programs should support gross motor development in addition to behavioral

and communication intervention for children diagnosed with ASD. All children's overall growth prospects depend on these motor abilities.

LIMITATIONS

The study had certain limitations. First, rather than using a diagnostic tool, as a developmental examination tool, the study employed the SGS II. The precision of the developmental profile that is obtained may be impacted by the use of screening tools, as minor differences like balance and coordination skills may go undetected. Furthermore, the study did not gather information on co-occurring conditions like developmental or intellectual disabilities, which could have been the primary cause of the disparities in motor growth among children with ASD and those without TD.

RECOMMENDATION

Based on the study's findings and limitations, we recommend implementing early screening and intervention programs to identify and address motor and cognitive delays in children with autism spectrum disorder (ASD) promptly. Comprehensive developmental assessments should be conducted, and tailored intervention programs that focus on motor and cognitive skills should be prioritized. Further research with larger, diverse populations is needed to confirm these findings. Additionally, educating parents and caregivers about the importance of early intervention and securing policy support and funding for these programs are essential to improve outcomes for children with ASD.

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LIST OF ABBREVIATIONS

ASD: Autism Spectrum Disorder
TD: Typically Developing
SGS II: Schedule of Growing Skills II
M-ABC2: Movement Assessment Battery for Children
MSEL: Mullen Scales of Early Learning
DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
HCTM: Hospital Counselor Tuanku Muhriz
DD: Developmental Delay
MOH: Ministry of Health
IQ: Intelligence Quotient

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CONFLICT OF INTEREST

The authors have no competing interests to declare.

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