ORIGINAL ARTICLE

Association of balance and levels of functional disability among children with autism spectrum disorder

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ABSTRACT

Background: In recent years, there has been an increased number of diagnosed cases of autism spectrum disorder (ASD), a persistent developmental condition resulting from both genetic and environmental influences. Beyond challenges in cognition, sensory processing and social interaction, children with ASD often exhibit physical impairments including reduced muscle strength, unsteadiness and balance difficulty. This study was designed to determine the association of balance and levels of functional disability among children with ASD.

Methodology: Analytical cross-sectional study was conducted in Lahore at Lahore Garrison Institute of Special Education and Help autism Pakistan. Children aged 5-12 years with mild to moderate autistic symptoms were included in study while children with any comorbidities and severe autistic conditions were excluded. Balance was assessed using Pediatric Balance Scale and functional disability levels were assessed using World Health Organization Disability Assessment Schedule 2 Children and Youth scale.

Results: Out of 377 children, 285 were males and 92 were females. Among children with low balance (n=340), 78.8% had severe disability, while 21.2% exhibited a moderate disability. In children with near to normal balance (n=37), 8.1% have no disability while 89.2% have mild disability and 2.7% have severe disability. Statistical analysis result showed a significant relationship ($P < 0.001$).

Conclusion: There is association between balance and levels of functional disability which indicates that autistic children with lower level of balance have higher levels of disability and those with near to normal balance have reduced levels of functional disability.

Keywords: Autism, balance, functional disability, levels of functional disability, postural instability

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INTRODUCTION

Autism spectrum disorder (ASD) involves a varied, multi-causal and abnormal developmental chronic illness (1). It usually begins in the early years of life and is usually diagnosed before the age of 3 (2). The word 'spectrum' indicates the diverse array of symptoms and difficulties faced by those with autism spectrum disorder (3). Total 350,000 children have autism according to Pakistan Autism Society and about 75% of children are affected with autism in Pakistan with a little awareness of sign and symptoms of this disease (4). About 1/44 children are affected by autism and prevalence is round about four to five times more in boys than girls (5, 6). Keeping in view the increasing prevalence, it is clear that ASD enforce a heavy health burden in all the communities of world (5).

Changes in genes and environmental influences are major contributors to the causes of autism spectrum disorder (6). Impairments in social interactions, sensory-related abnormalities and intellectual disabilities can occur in autism (2, 7). Autism is accompanied by other associated conditions including epilepsy, depression, anxiety, increased stress level affecting the sleep schedule, inducing self-harming habits, isolation from family and variable attention stimulus trait (VAST) (8). Children with ASD often exhibit several physical deficits, including impaired coordination and balance, changes in muscle tone, decreased muscle strength and reduced postural reactions (9). Both fine and gross motor skills are impacted in ASD (10). Motor disturbances can cause dynamic and static postural challenges that can lead to poor balance control (11,12). Hypotonia, increased anxiety level, decreased level of speed and agility can lead to impaired balance. As a result, there is activity avoidance due to fear among children with autism.

Almost 79% of autistic children have motor impairments that are associated with lower levels of self-perception and resultantly it reduces the capacity of a child to participate in any physical activity(13). Balance, eye-hand coordination, grasping, strength and fine-hand use are among the fundamental components of daily living skills

(DLS). Autistic child struggles with these building blocks of DLS and are poorly independent in daily life activities (14). Physical limitations can hinder social interactions in children with autism, affecting their social skills and executive functions (15). Moreover, children with ASD faces clumsiness, a sluggish walk and irregular heartbeat pulsation in hand and foot leading to refusals for activities and poor self-esteem. Mainly the dual-task activities are affected (16).

ASD, is a neurodevelopmental disorder that persists throughout life, is progressively more common in our society. Balance is affected that causes postural instability in children with difficulty in maintaining static and dynamic positions. Because of balance impairments, there might be reduced level of functional independence, physical activity and difficulty in performing ADLs. This study specifically examined the association of balance with functional disability to determine the levels of functional disability faced by autistic individuals due to balance impairments.

MATERIAL AND METHODS

In this analytical cross-sectional study, a sample of size of 377 was selected and data collection was completed from special children institutes Lahore Garrison School for special children (LGES) and Help Autism Pakistan. Children of both gender who could follow the verbal commands and had mild to moderate ASD diagnosis (Scores less than 37 on Childhood Autism Rating Scale-CARS) with age ranging from 5-12 years were included in the study. While children who had disorders like epileptic seizures and deafness (14), Wheelchair bound (17), children with injury to lower extremity such as fracture and amputation, any visual impairments, asthmatic and schizophrenic autistic children (18) and children who use assistive devices were excluded from the study.

Outcome Measure Tools

Pediatric Balance Scale (PBS) was used to determine balance in children with autism. It is a 14-item scale with each item scored from 0 points to 4 points (19). The total score varies from 0-56, lower scores signify a greater rank of balance disability. The cut off value taken for PBS is 45.5 with lower values showing greater balance impairment (17).

WHODAS 2 Children and Youth: The World Health Organization Disability Assessment Schedule Children and Youth (WHODAS-Child) was used to evaluate levels of functional disabilities in children with autism. This assessment tool includes 36 items, each ranging from 'none' to 'extreme difficulty.' A domain-weighted system is used to calculate the WHODAS-Child score, based on the maximum possible score for the total/domain. Higher scores correlate with a higher level of disability (20): None level of disability: 0 to 0.49, Mild level of disability: 0.5 to 1.49, Moderate level of disability: 1.5 to 2.49, Severe level of disability: 2.5 to 3.49, Extreme level of disability: 3.5 to 4.0. The association between balance and functional disability levels in children having autism spectrum disorder was evaluated in SPSS version 23, using the chi-square test.

RESULTS

The mean age of the children was 8.22±2.11 years where age ranged between 5-12 years. Among 377, 285(76%) were males and 92 (24%) were females. Moreover, 370 (98.1%) participants showed normal BMI (body mass index) and 7 (1.9%) participants deviated from normal and were overweight. Table 1 is showing the functional disability levels by operating WHODAS 2.0 scale, results indicated that 0.8% (n=3) participants were with no disability, 8.8% (n=33) participants were with mild disability, 19.1% (n=72) with moderate disability and 71.4% (n=269) were with severe disability. Table 2 is showing the results of Pediatric Balance Scale which shows that 340 (90.2%) had low balance and 37 (9.8%) participants had near to normal balance. Among individuals with low balance (n=340), 78.8% had severe disability, while 21.2% exhibited a moderate disability. Table 3 shows that None of these individuals had mild or no disability which suggested that individuals with low balance had higher levels of disabilities. In contrast with the individuals having near to normal balance (n=37), 8.1% had no disability while 89.2% had mild disability and 2.7% had severe disability which showed that normal balance decreases the chances of getting higher levels of disability. Overall, across all 377 participants, 0.8% had no disability, 8.8% exhibited a mild level of disability, 19.1% had moderate level of disability and 71.4% were classified as having severe level of disability. The statistical analysis indicated a significant association ($P < 0.001$).

The statistically significant P-value suggests that the differences observed between groups are unlikely to be due to chance. Balance played a vital role in the perceived degree of disability, according to the findings. Individuals with low

balance reported experiencing considerably higher levels of disability

Table 1 Distribution of Functional Disability levels among participants

Categories	Frequency	Percentage
No disability	3	0.80%
Mild disability	33	8.80%
Moderate disability	72	19.10%
Severe disability	269	71.40%

Table 2 Distribution of Balance among participants

Categories	**Frequency**	**Percentage**
Low balance	340	90.20%
Near to normal balance	37	9.80%
Total	377	100.00%

Table 3 Crosstabulation of Balance and Levels of Functional Disability

Balance	Levels of Functional Disability			
	No Disability	Mild Disability	Moderate Disability	Severe Disability
Low balance	0(0.0%)	0(0.0%)	72(21.2%)	268 (78.8%)
Near to normal balance	3(8.1%)	33(89.2%)	0(0.0%)	1(2.7%)
Total	3(0.80%)	33(8.80%)	72 (19.10%)	269 (71.40%)
P value			<0.001	

DISCUSSION

This study was conducted to determine the association of balance and level of functional disability in children with autism spectrum disorder. The data revealed that 90.2% of participants exhibited balance problems, while only a small fraction demonstrated near-normal balance. Furthermore, the majority of children were classified as having severe functional disability, with only a minority experiencing mild or no disability. These results are consistent with a substantial body of literature indicating that motor impairments, particularly in balance and coordination, are common and significant features of autism spectrum disorder (21-23).

Balance difficulties in children with ASD are thought to stem from complex interactions between sensory processing, motor planning, and the timing and sequencing of muscle movements. Research has shown that these children often have deficits in both static and dynamic balance, which can severely impact their ability to participate in daily activities and social interactions.(21, 24). The high proportion of severe functional disability observed in this study further underscores the pervasive impact of these motor challenges on the overall functioning and independence of children with ASD

In the previous study, the balance was evaluated among 30 participants of ASD including both male and female showed that 100% participants fall within the normal ranges (25). While in the current study, results of PBS among 377 participants of ASD showed that 90.2% deviated from the normal ranges and 9.8% participants fell within the normal ranges. The previous study was similar to recent study as in this both participants are involved. The previous study participants showed 100% result in contrast to current study where a number of participants showed deviation from the normal balance.

In another previous study, results of balance in pediatric patients with autism spectrum disorder showed that 80% of participants had abnormal balance outcomes while 20% successfully completed the balance testing (12). According to recent study, only 9.8% participants successfully completed the balance testing while remaining 90.2% showed abnormal balance testing. The previous study was in accordance to current study as both genders male and females participated in both studies but results of previous study showed more abnormality in balance as compared to current study. In this way, this study is in contrast to current study.

Furthermore, a cross-sectional study consisting of both male and female participants was conducted to evaluate the functioning disability and health of

children with autism spectrum disorder. Results showed that 25.5% had mild disability, 27.5% had moderate disability, 12.5% had severe and 12.5% had complete disability among children with autism spectrum disorder. Moreover, 22% children showed no difficulty(26). The results obtained from the current study showed that 0.8% participants were with no disability, 8.8% participants were with mild disability, 19.1% were moderate disability and 71.4% were with severe disability. This current study was in relevance to previous study as both studies had explained about different levels of functional disability among children with autism spectrum disorder. But both studies had showed different results of disability ranges. In this way, this study is in contrast to previous study.

Thus, this study reveals a strong link between balance impairments and higher functional disability in children with ASD. The high prevalence of motor deficits underscores their impact on daily functioning and independence. While variations with previous studies exist, consistent evidence supports the need for targeted balance interventions. Future research should explore causes and treatment strategies to improve outcomes.

CONCLUSION

This study concluded that here is association between balance and levels of functional disability which indicates that autistic children with lower level of balance have higher levels of disability and autistic children having near to normal balance have reduced levels of functional disability.

Ethical considerations:

Rights and dignity of all individuals were the prior consideration. Research process did not cause any harm to the subjects. Accurate information to patients was provided and written consent was taken from the subjects. Subject's details and data confidentiality was maintained at every level. Ethical clearance was taken from the ethical committee of the university. IRB number of the permission letter issued by university was IRB-USA/FAHS/2025/20.

Consent to participants: Written consent was taken from the parents/guardians of the children with ASD. All the relevant guidelines and rules were followed during the method of data collection.

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Authors' contribution: All authors read and approved the final manuscript.

CONFLICT OF INTEREST: The authors declare no conflict of interests.

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