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Psychological development serves as a reliable predictor of autism spectrum disorder among toddlers and preschoolers

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ORIGINAL ARTICLE

Psychological Development Serves as a Reliable Predictor of Autism Spectrum Disorder Among Toddlers and Preschoolers

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Abstract

Objectives: **The goal of the current study was to use psychological development in toddlers and preschoolers to predict autism spectrum disorder (ASD). It was also looked at how sex differences affected ASD.**

Methods: **In this study (Case-Control), a purposive sample of 100 Children from the Karbala province-Iraq, ranging in age from 2 to 7, took part. There were two groups: 50 healthy Children (Control group) and 50 Children with ASD (Test group). To gauge the child's aptitude and response for communication and social interaction, the psychological development questionnaire-1 (PDQ-1) was used.**

Results: **The present study's sample was categorized into 2 groups, control and test groups. According to the PDQ-1 results, healthy children scored 16.16 ± 1.78 (Mean ± SD). Children with ASD received a score of 7.02 ± 2.97 (Mean ± SD). Two-tailed unpaired t-test results revealed significant differences between healthy and ASD children ($P < 0.001$), healthy & ASD males ($P = 0.041$), healthy & ASD females ($P < 0.001$), and ASD males & ASD females ($P < 0.01$). The Spearman correlation coefficient (SCC) was carried out to calculate the correlations (r) between PDQ-1 scores of ASD males and ASD females. The results showed that there were statistically significant differences between them ($P < 0.01$).**

Conclusion: **The PDQ-1 may be used as a reliable screener for ASD in toddlers and preschoolers. When assessing ASD, sex differences should be considered.**

Keywords: Psychological development, ASD, PDQ-1, Children, Iraq

Introduction

Autism spectrum disorder (ASD) is a long-life neurodevelopmental illness that affects a person's ability for social interaction and communication. It seems to be one of the childhood disabilities rising fastest (Talib et al., 2021). Additionally, autism is still a fascinating condition that has arguably received the greatest scientific attention among all children psychiatric disorders (Wolff, 2004).

Academic specialists and professionals have become more concerned about the incidence of ASD over the past 20 years. After publication of the first study on ASD in England, 1966 (Lotter, 1966), there have been numerous surveys with wildly varied prevalence estimates. In the 1970s, prevalence of ASD was thought to be about 2 in 10,000 children, leading to the initial perception that it was rare (Kawamura et al., 2008). However, at the close of the 20th century, this perspective started to shift. Changes in epidemiological study methodologies, screening instruments, and diagnostic criteria could all contribute to this rise (Gillberg & Wing, 1999). Even while ASD is widely investigated in Europe and America, it is still a novel health issue in the Middle East. In Asia, the prevalence of ASD is poorly understood (Sun & Allison, 2010).

As a result, a three-year countrywide screening study for autism in Iran found a prevalence of 6.26 per 10,000 people. This is similar to rates reported in several other countries but lower than more recent estimates in more industrialized nations (Samadi et al., 2012).

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The prevalence of comorbid mental diseases was examined by Amr et al. (2012) in their research of a sample of children with ASD drawn from Egypt, the Kingdom of Saudi Arabia, and Jordan. Attention deficit/hyperactivity disorder (ADHD), anxiety disorders, and major depression were the most documented comorbid conditions (Amr et al., 2012). These results highlighted the extensive range of mental comorbidities that affect children with ASD and may serve as potential intervention targets. Dietary state and parent-child relationship might affect on child's early motor and cognitive development (Dagvadorj et al., 2018; Itahashi et al., 2020). Adolescent wellbeing and functional outcomes are significantly influenced by their relationship with their parents in the childhood. It is anticipated that neuroimaging will close the knowledge gap between the complex interaction between child-parent relationships and teenage difficulties. When parents interact with their Children, stronger attachment relationships could help Children to develop. Parents should focus on the development of their psychological status and have positive interactions with their children to enhance cognition, personality, and adaptability (Mo et al., 2021).

Furthermore, Swords et al. (2011) showed that the causes of psychological issues in children and adolescents were multifaceted and included both individual and environmental influences (Swords et al., 2011). ASD is characterized by delayed development (Bello et al., 2013). Early diagnosis of delays in psychological development of young children is pivotal to giving them the chance to undergo early intervention therapies that will improve their motor and cognitive abilities (Rice et al., 2014). Early infancy developmental motor abnormalities may also be crucial indicators of ASD, aiding in diagnosis (Harris, 2016). The prominent risk factors for developmental disorders are low socioeconomic status, early births, and history of medical conditions (Chen et al., 2020). Additionally, social status and mothers' poor psychological states may contribute to developmental delays in young children (Dagvadorj et al., 2018). The prognosis of ASD sufferers' adaptive behavior is quite variable (Alawad et al., 2019). Mazefsky et al. (2008) investigated family history as a potential source of variation in adaptive behavior in ASD. On the other hand, ASD is heavily influenced by heredity (Mazefsky et al., 2008). Accordingly, Karmeet et al. (2015) found that patients with ASD in Iraq have increased expression of the contactin associated protein-like gene (CNTNAP2) (Karmeet et al., 2015). Magnetic resonance imaging (MRI) is crucial for the early identification of brain abnormalities and subsequent evaluation of the likelihood of developing ASD (Hiremath et al., 2021).

Additionally, parenting techniques, disruptive and constructive marital conflicts may have direct and indirect impacts on children's social skill development (Hosokawa & Katsura, 2017). According to Hellendoorn et al. (2015), human interactions with the environment can lead to the cognition (Hellendoorn et al., 2015). A 2017 study by Yildirim and Akamca also demonstrated the benefits of outdoor role for young children's cognitive, psychological, and motor development (Yıldırım and Akamca, 2017). Using the Modified Checklist for Autism in Toddlers (M-CHAT) during ASD improved long-term prognosis and early diagnosis of ASD. Additionally, it decreased ASD false-positive rates (Robins et al., 2014). In accordance, PDQ-1 could be a helpful tool to the developmental monitoring of ASD (Zahorodny et al., 2018). The current study's goals are to use the PDQ-1 to predict ASD in toddlers and preschoolers and to reveal how sex differences may affect ASD.

Materials and methods

Participants

Through an informed consent, a purposive sample of 100 children from Karbala province, Iraq, aged 2 to 7, participated in the present study. In accordance, 50 autistic children served as the test group and 50 healthy children served as the control group. The Al-Kafeel Institute for People with Special Needs accepted the most autistic children, but not the others. The healthy controls, on the other hand, were registered in several kindergartens around the city and countryside of the Karbala province.

Experimental protocol

A case-control study was carried out and PDQ-1 is a questionnaire of 10-item that used to assess a child's aptitude for social interaction and communication. Two questions focus on the child's speech vocabulary, while the other seven detect the level of child's social interest, imitation, and reciprocity. One question concerns the toddler's hearing receptivity. By caregiver, children's responses are graded from 0 to 2 points, and the overall scores are calculated. The PDQ-1 score is 20. The risk threshold (screen-positive) is set at a PDQ-1 score of 12 (Zahorodny et al., 2018).

Statistical analysis

The data are expressed as means ± SD. IBM SPSS (IBM SPSS Statistics Software, USA, version 27) was utilized. Two-tailed unpaired t-tests were used for comparisons between various groups. Male and female autistics' correlations (r) were calculated using the non-parametric Spearman correlation coefficient. When $P < 0.05$, differences were considered statistically significant.

Results

The findings are based on information gathered from 100 Children in Karbala, Iraq, both with and without ASD. The study's sample categorized into 2 groups; Ctrl and ASD groups. According to the PDQ-1 results, Ctrl scored 16.16 ± 1.78 (Mean ± SD). Males outnumbered females in percentage (See Table 1). In addition, ASD scores were 7.02 ± 2.97 (Mean ± SD). Similar to the Ctrl, ASD Children had more males than females (See Table 2). To learn more about the differences between healthy and autistic children, comparisons between their PDQ-1 scores were made. Significant differences were found in the two-tailed unpaired t test findings (Fig. 1, $P < 0.001$).

Comparison between healthy and autistic males' PDQ-1 scores were also done. Significant differences were seen in the two-tailed unpaired t test results (Fig. 2, $P = 0.041$). In order to learn more about the differences between healthy and autistic females, PDQ-1 data comparisons were also used. Significant differences were seen (Fig. 3, $P < 0.001$).

Additionally, a comparison of ASD males' and ASD females' PDQ-1 results was done. Significant differences between them were revealed by the results (Fig. 4, $P < 0.01$). Furthermore, the SCC was used to calculate the correlation (r) between PDQ-1 scores of autistic males and autistic females. The findings (Table 3) showed that there was a significant correlation between them.

Table 1. Distribution of healthy children by age and sex.

Age (years)		No.	%
2–3		12	24
4–5		17	34
6–7		21	42
Mean ± SD		16.16 ± 1.78	
Gender	Males	28	56
	Females	22	44

Table 2. Distribution of autistic children by age and sex.

Age (years)		No.	%
2–3		9	18
4–5		12	24
6–7		29	58
Mean ± SD		7.02 ± 2.97	
Gender	Males	30	60
	Females	20	40

Discussion

Multiple developmental aspects are affected by ASD (Szatmari et al., 2021). ASD seems to be one of the childhood disabilities rising fastest (Talib et al.,

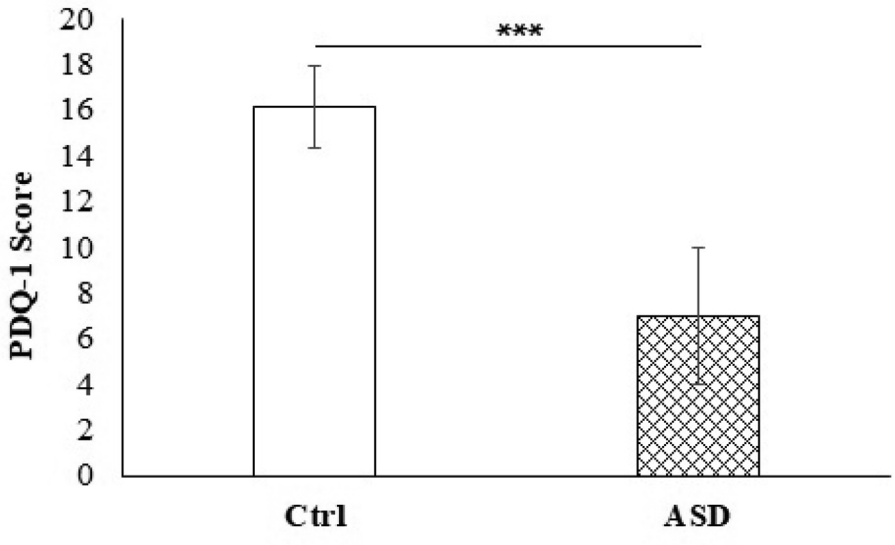

*Fig. 1. Comparison of the PDQ-1 scores of healthy and autistic children. PDQ-1: Psychological Development Questionnaire-1. Ctrl: Control, ASD: Autism Spectrum Disorder, and ***: P < 0.001.*

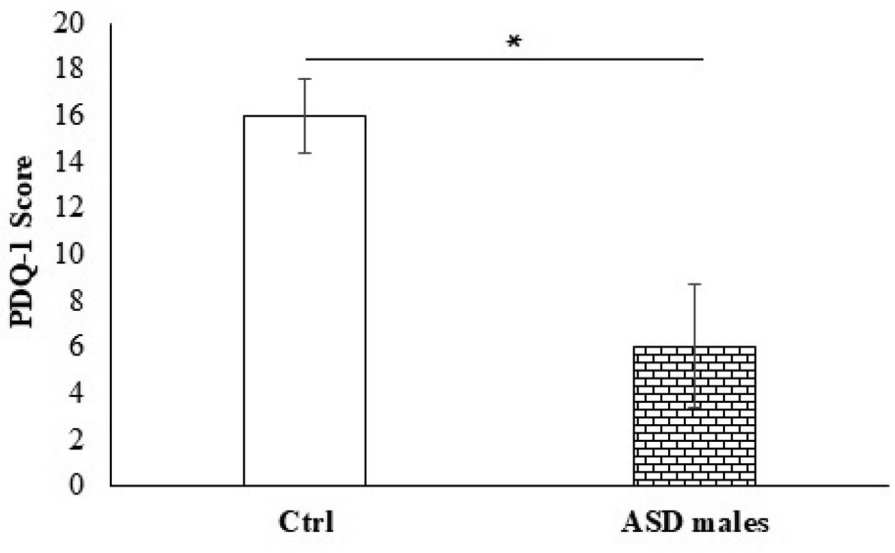

*Fig. 2. Comparison of the PDQ-1 scores of healthy and autistic males. PDQ-1: Psychological Development Questionnaire-1, Ctrl: Control, ASD: Autism Spectrum Disorder, and *: P < 0.05.*

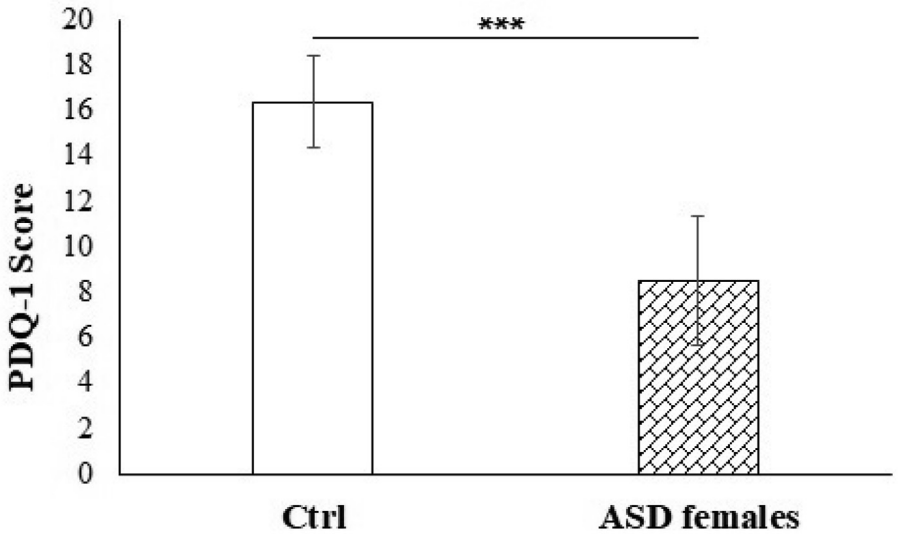

Fig. 3. Comparison of the PDQ-1 scores of healthy and autistic females. PDQ-1: Psychological Development Questionnaire-1, Ctrl: Control, and ASD: Autism Spectrum Disorder.

2021). The current study was conducted to predict ASD in toddlers and preschoolers. It also focused on how sex differences affect ASD. Early diagnosis of developmental disorders is pivotal for giving them the chance to receive early intervention programs and improve the functional skills (Rice et al., 2014). Early detection of ASD is crucial (Bello et al., 2013). PDQ-1 utilized in connection with our investigation (Zahorodny et al., 2018). Overall, the findings revealed a significant difference between healthy and autistic children's PDQ-1 scores. According to the findings, there was a significant difference between PDQ-1 scores of ASD males and controls. Additionally, a significant difference was documented between the PDQ-1 scores of ASD females and controls. Accordingly, the findings of the current study and those of the earlier ones have been compared (Amr et al., 2012; Horwitz et al., 2020; Samadi et al., 2012). According to previous investigations, males are more likely than females to have ASD (Antezana et al., 2019). In addition, ASD impacts females less frequently than males, and a number of sex-specific genetic and hormonal factors may contribute (Agrawal et al., 2018; Werling & Geschwind, 2013). Similar to this, Craig et al. (2020) using sex-specific linear regression indicated that

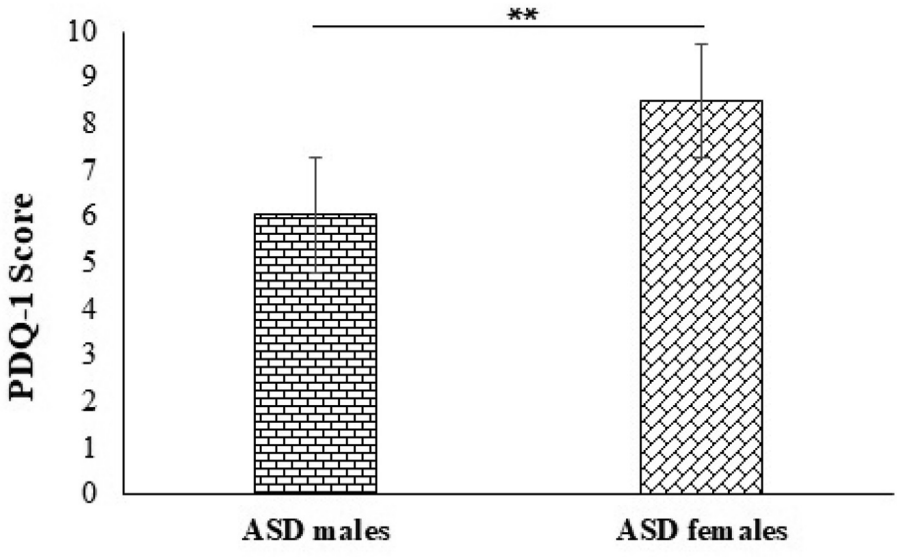

*Fig. 4. Comparison between autistic males' and autistic females' PDQ-1 scores. PDQ-1: Psychological Development Questionnaire-1 ASD: Autism Spectrum Disorder, and **: P < 0.01.*

Table 3. Correlation of PDQ-1 scores of autistic males and females.

	Autistic males vs Autistic females
Spearman correlation (r)	0.415
P (Two-tailed)	0.01
N	50

Correlation is significant at the P < 0.01 level.

higher motor abilities were considered as a predictive tool of poor social behaviors in males but not in females (Craig et al., 2020). The PDQ-1 scores of autistic males and autistic females differed significantly, according to a two-tailed unpaired t-test. Additionally, correlation (r) values showed a significant correlation between them.

Conversely, Prosperi et al. (2021) found no statistically significant difference between ASD severity in preschool-aged females and males (Prosperi et al., 2021). On the other hand, a recent study found that restricted and repetitive behaviors in ASD may differ depending on the sex of the individual. This finding is contradictory, especially for toddlers and preschoolers. Additional proof of sex-based differences in ASD symptoms that exist from an early age is provided by this study (Stephenson et al., 2023). Future studies should investigate sex-related heterogeneity in ASD using big data approaches and new stratification techniques to develop individualized, sex-aware interventions and supports for autistic children.

Conclusion

PDQ-1 received favorable reviews from toddler and preschool-aged children in Karbala province, Iraq, for its ability to detect ASD. As a result, sex differences had a significant impact on ASD. Therefore, sex differences should be taken into account in future ASD researches.

Author contributions

Hussein A. Ghanimi: Manuscript's writing—original draft, also review and editing.

Ethics

Informed consent was obtained from the parents of all participants. The informed consents signed by their parents as an official agreement.

Funding

None.

Conflicts of interest

None declared.

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