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Effective Factors on Correct Diagnosis and Timely Interventions for Autism Spectrum Disorders in Children

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ABSTRACT

Objective: Prevention and control of the disease in children with autism spectrum disorders in a country requires policies and decisions as well as accurate statistics and information in this field. Therefore, the present study was conducted with the aim of investigating the effective factors for correct diagnosis and timely interventions in autism spectrum disorders in children under 7 years of age.

Methods: In this cross-sectional study, information on 83 children with autism spectrum disorder under 7 years of age diagnosed in Tehran using the Gilliam 3 Autism Measurement Scale, Connors Measurement Scale, PEP3 diagnostic test, and the researcher-made diagnostic package was examined. The collected data were analyzed using descriptive statistics, including mean and frequency, and inferential statistics, including chi-square and analysis of variance.

Results: After analyzing the data using SPSS software, it was found that the three components of tool, age and severity of disorder are the most important factors contributing to correct diagnosis and timely intervention in autism spectrum disorders in children under 7 years of age.

Conclusions: Considering that the results of this study have shown that the three components of tool , age and severity of the disorder are effective for timely diagnosis, it is suggested that families use testing as soon as they see the slightest symptoms in their children at a young age. It is appropriate to diagnose this disorder early, which can lead to partial control of this disease in children.

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Introduction

Autism spectrum disorders, previously known as pervasive developmental disorders, represent a cluster of neurodevelopmental syndromes that exhibit phenotypical diversity, possess various genetic inheritances, and manifest a wide array of communication and social behavioral impairments. These disorders are characterized by restricted and repetitive patterns of behavior, tendencies, and activities (Volkmar, 2019). The consideration of autism spectrum disorders in diagnosis is paramount for individuals displaying deficits in social communication. Early in development, individuals with ASD may demonstrate solely limited/repetitive behavior patterns, tendencies, and activities, hence necessitating a comprehensive acquisition of historical information. If the developmental history does not reveal indications of restricted/repetitive behavior patterns, tendencies, or activities, further evaluation is required (Goldstein & Ozonoff, 2018).

A disorder closely linked to autism spectrum disorder is anxiety, as discussed in an article titled "Conceptualization of Associated Anxiety in Autism Spectrum Disorders." Three possible explanations have emerged from studies: 1- Anxiety in autism may stem from the core symptoms of autism, such as deficits in social skills and heightened sensory responsiveness. 2- Anomalies in emotional regulation could underlie anxiety in autism 3- Intolerance of ambiguity might serve as the primary trigger for anxiety in autism (Behzadpour et al., 1399). Data reveals an underdiagnosis of autism in both children and adults, occasionally leading to confusion with other disorders exhibiting similar symptoms. This could be attributed to a lack of awareness regarding medical conditions and the intricate nature of the autism spectrum, resulting in delayed diagnoses due to the overlapping symptoms shared with other disorders (Fusar-Poli et al., 2022).

The query arises as to the definition of diagnostic error, the occurrence of missed diagnoses, and the circumstances under which these errors transpire. When does a diagnosis become classified as a misdiagnosis? A diagnostic error or misdiagnosis materializes when an individual's judgment regarding a particular illness or condition deviates from the actual diagnosis (Campoy-Cubillo, 2015).

During consultations with medical specialists, patients anticipate alleviation of pain and discomfort through inquiries and examinations; nevertheless, the complexity of certain cases poses

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challenges in disease identification and treatment. Regrettably, diagnostic errors may occur when medical conditions are inaccurately diagnosed by healthcare professionals (Kalra et al., 2023). Numerous diseases present similar symptoms or lack definitive diagnostic tests, prompting doctors to delve into patients' medical histories and pose additional questions to discern the underlying issues. However, the interpretation of these findings can vary based on individual experiences and conditions, potentially leading to diagnostic inaccuracies. Despite doctors' best efforts in making informed judgments or conducting thorough tests, the intricate nature of certain diseases may hinder accurate diagnoses, highlighting the inherent imperfections in medical assessments.

Another issue arises when a misdiagnosis results in a significant financial investment to restore an individual's health. Accurate diagnosis is crucial as resources, money, and efforts may be squandered in the absence of it, potentially leading to irreversible delays in obtaining the correct diagnosis. Misdiagnosis commonly denotes a physician's failure or delay in pinpointing a medical condition during the initial consultation. Despite the similar pronunciation and sound of misdiagnosis and missed diagnoses, there exist numerous parallels between these terms, with both culminating in comparable outcomes. However, a notable and substantive disparity exists between the two. It is not widely recognized that misdiagnosis and missed diagnoses can have detrimental impacts on medical conditions, causing substantial harm (Li et al., 2022).

Many individuals erroneously perceive misdiagnosis and missed diagnoses as routine occurrences in healthcare. There is a lack of awareness regarding the legal accountability of healthcare providers for escalating medical conditions or expenses due to delayed or inadequate treatment. Misdiagnosis poses a grave danger as it can lead to ineffective, superfluous, and hazardous treatments while depriving individuals of the chance for appropriate care and interventions. Conversely, missed diagnoses, implying a failure to diagnose or a lack of diagnosis, often result in improper treatment. In certain medical scenarios, erroneous diagnoses can diverge so significantly from reality that they may culminate in a patient's demise or disability due to improper or absent treatment. Pinpointing the accurate prevalence and percentage of misdiagnoses and diagnostic inaccuracies remains challenging. Experts suggest an approximate 5% error rate among patients with head and foot ailments (Baudrand et al., 2016). This subject matter is addressed in an article titled "Missed Diagnoses and the Distinction Between Autistic Children and Typically Developing Individuals." The research employs a nationwide survey that assesses the likelihood

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of diagnoses and service pathways for current and prior diagnoses. The study participants, aged between 6 and 17 years, had parents who sought early identification and access to medical or healthcare services for their children. The initial group consisted of individuals diagnosed with autism or its subcategories, and their scores were juxtaposed with the current attributes of undiagnosed cases. Notably, about 13% of children had never received an autism diagnosis, indicating instances of missed diagnoses. A majority of parents (74%) attributed this oversight to updated information. Discrepancies in autism spectrum diagnoses may stem from diagnostic inaccuracies, individual maturation, or administered treatments (Blumberg et al., 2016).

Misdiagnosis stands out as a prevalent and concerning issue within the field of early psychology. By understanding the causes and implications of misdiagnosis, we can enhance our comprehension of how this misidentification occurs, its detrimental effects, and the significance of obtaining accurate diagnoses for the recovery process. An illustration of this can be seen in the numerous obstacles encountered in identifying and diagnosing autism spectrum disorder within China. The prevalence of autism in China consistently registers lower figures compared to Western nations. The undervaluation of prevalence rates may stem from various factors such as disparities in screening methods, diverse diagnostic approaches, discrepancies in document translation, and variations in diagnostic criteria (Pang et al., 2018). Concerning the downsides of inaccurate diagnoses, it is worth mentioning that they can lead to confusion for the patient and their social circle, as well as result in the administration of inappropriate medications that exacerbate the patient's condition. The root causes of these diagnostic inaccuracies and their occurrence are attributed to receiving incorrect patient histories, masking symptoms, providing multiple conflicting diagnoses, issuing a shifting diagnosis that alters with each assessment, failing to identify all disorders present, and the subjective judgement of the psychiatrist (Howard, 2019). Inadequate treatment impedes the individual from receiving proper care for their ailment, fuels the escalation of their distress, diminishes prospects for recovery, and heightens the risk of developing a debilitating mental health condition. Diagnostic mistakes and improper interventions can also lead to functional impairment in the individual, intensify the complexities of the disorder, and trigger a cascade of novel symptoms (Merten et al., 2017).

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Based on the aforementioned literature, this study was undertaken to explore the determinants influencing the diagnosis of autism spectrum disorders in children below the age of 7, aiming to furnish insights that could assist families in promptly identifying autism in their children and play a pivotal role in disease prevention and management.

Materials and Methods

This investigation constitutes a descriptive survey and is characterized by its applied nature. Applied research denotes research that leverages the outcomes of fundamental research to enhance and refine behaviors, techniques, instruments, apparatus, commodities, infrastructures, and configurations employed by human communities. The statistical populace under scrutiny in this study encompasses all children below the age of 7 who have sought services from private counseling, welfare, and educational establishments catering to exceptional children across four geographical regions in Tehran, namely North, South, East, and West, during the initial three months subsequent to the commencement of the study, following a diagnosis of neurodevelopmental conditions such as autism spectrum disorder and accompanying disorders. Nonetheless, owing to myriad challenges in sample collection, lack of cooperation from the facilities, and absence of case presentations from these establishments, a total of 31 samples were identified with autism spectrum disorder, 26 samples were identified with autism spectrum disorder along with another personality disorder that coincides with autism (comorbid disorder), and 26 samples were exclusively chosen based on the presence of comorbid disorders related to autism. The inclusion criteria encompassed possessing a sole diagnostic classification, being in good physical health, and refraining from any form of pharmacological or non-pharmacological therapy.

The research instruments utilized consisted of the Gilliam 3 autism assessment scale, Connors assessment scale, PEP3 diagnostic appraisal test, and a diagnostic toolkit devised by the researcher comprising a fundamental diagnostic data questionnaire and adherence to interview principles. The data collected underwent analysis through descriptive statistical techniques encompassing mean and frequency, alongside a comprehensive statistical examination involving analysis of variance.

Results

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83 children were involved in the study, with 56 being boys and 27 being girls. Put differently, 67.5% were male while 32.5% were female. Furthermore, the average age of the participants was 4.6 years, with a standard deviation of 0.97. The youngest child in the research was 2.5 years old, while the oldest was 6.9 years old. The data presented in Table 1 illustrates that 47% were classified as grade 3 (severe) and 35% as grade 1 (mild) during the initial severity assessment. Regarding the secondary severity diagnosis, 40% were categorized as grade 1 (mild) and 31% as grade 3 (severe).

Table 1. Frequency of severity of autism spectrum disorders

Severity	Severity rate	Frequency	%	Cumulative %
Primary severity	1	29	34.90	34.9
	2	15	18.10	53
	3	39	47	100
Secondary severity	1	33	39.80	.9.80
	2	24	28.90	68.70
	3	26	31.30	100

Table 2 shows that in 50% of cases, the diagnosis was made using the tool of autism disorders. In 17% by other tools and in 33.7% no information is available about the diagnostic tool. One-way analysis of variance was used to investigate the effect of age on diagnosis groups. The distribution of the normal age variable and its variance were homogeneous between the groups (F=0.893 and $p < 0.449$).

Table 2. Frequency of diagnostic tools

Assessment tool	Frequency	%	Cumulative %
Not specified	28	33.70	33.70
Autism diagnosis tool	41	49.40	83.10
Other tools	14	16.90	100

Table 3. One-way analysis of variance test results to compare age at diagnosis

Source	SS	DF	MS	F	P
Between group	15.67	3	5.22	6.67	0.001
Within group	61.81	79	0.78		
Total	77.49	82	-		

As reported in Table 3, the value of the F statistic is significant at the 0.01 level ($p<0.01$). In other words, age is effective in diagnosis. Chi-square test was used to investigate the effect of disorder

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severity on diagnosis groups. The results of the test showed that the variable distribution of the severity of the disorder was normal.

Table 4. Chi-square test results to compare the severity of impairment in diagnosis

Severity diagnosis	Severity rate	Missed diagnosis	Correct diagnosis	Wrong diagnosis	Severity difference	X^2	P
Primary severity	1	12	11	4	2	5.06	0.53
	2	5	6	2	2		
	3	12	10	8	9		
Secondary severity	1	13	11	6	3	13.32	0.03
	2	7	6	2	9		
	3	9	10	6	1		

According to Table 4, in secondary diagnosis, severity is effective in diagnosis and is predictable (P<0.05), while in primary diagnosis, severity is not effective in diagnosis and is not predictable. (P>0.05). Chi-square test was used to check the effectiveness of the tool in disease diagnosis. As can be seen in Table 5, the chi-square value is significant. In other words, the type of tool is effective in diagnosis.

Table 5. The results of the chi-square test and the effect of the tool on the diagnosis of autism

Assessment tool	Missed diagnosis	Correct diagnosis	Wrong diagnosis	Total	Severity difference	X^2	P
Not specified	13	1	13	28	1	6	0.001
Autism diagnosis tool	11	26	0	41	4		
Other tools	5	0	1	14	8		

Discussion

The current study demonstrates that the proper utilization of diagnostic instruments for autism plays a crucial role in the identification of children within this spectrum, consequently averting diagnostic errors or inaccuracies. This research outcome aligns with the studies conducted by Bazrafshan and Sadeghi (2021), Randall et al. (2018), Rey et al. (2019), Aggarwal and Angus (2015), and (Durkin et al., 2015). Moreover, our findings indicate that the severity classification serves as a significant factor in the diagnosis of autism spectrum disorders. The outcomes of this

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segment of the study are consistent with those of Gotham et al. (2009) and Brentani et al. (2013). Analysis of Table 5's results leads to the conclusion that the age bracket stands as a pivotal factor in the diagnosis of autism spectrum disorders. The findings of this section of the research are in harmony with the outcomes of Rump et al. (2009), Fedor et al. (2018), and Rey et al. (2019).

In elucidating the findings of this research, it is noteworthy that as per the data gathered from the families involved in this study, the majority of them initially seek consultation from either a neurologist or a pediatrician upon encountering behavioral issues in their children. These families exhibit a lack of awareness regarding the availability of psychologists specializing in exceptional children and doctors catering to their needs. Given that professionals from other fields rely solely on clinical symptoms and personal observations for identifying such children, with minimal employment of autism diagnostic tools, a plethora of diagnostic errors become evident. This could potentially stem from a lack of expertise leading to erroneous diagnoses. Conversely, an individual utilizing an autism diagnostic tool, even without extensive proficiency, undergoes training in its operation, with a substantial portion relying on the correct application of the tool, supplemented by personal acumen and precision.

Families of individuals with autism often perceive the specialized treatment facilities and diagnostic procedures as inadequate, expressing concerns about the lengthy diagnosis process and the high treatment expenses, assigning blame to the Ministry of Health and Welfare officials. The issue necessitates continuous and immediate attention during the diagnosis and treatment phases for individuals with autism. Behavioral science experts assert that autism spectrum disorder diagnosis typically occurs around the age of three; however, the initial diagnosis should ideally happen at 18 months, as parents typically observe unusual behaviors in their children or developmental delays during this time.

Certain parents posit that their affected child exhibited distinct characteristics from birth, while others attest that their child initially displayed typical development but later regressed. Initially, medical professionals may overlook autism symptoms, assuming that children will naturally acquire skills from their peers, thus advising parents to adopt a wait-and-see approach. It is advisable for parents with concerns regarding their child's development to promptly consult with their healthcare provider about autism screening. Despite parental apprehensions about labeling a

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young child with autism, early interventions can commence following an early diagnosis. Presently, there is no foolproof method to prevent autism, and no universally acknowledged effective treatment exists. However, behavioral interventions, regardless of the type, have shown considerable positive outcomes.

Psychologists suggest that engaging in early behavioral interventions for a minimum of two years during the preschool phase can significantly enhance the IQ and verbal skills of numerous children with autism spectrum disorders. Effective programs primarily target enhancing communication, social, and cognitive abilities. Consequently, in several nations, autism is not universally acknowledged as a disorder, posing challenges for accurate diagnoses. Governments should ensure the availability of resources to identify at-risk children, potentially through routine check-ups to monitor the child's well-being. Early, evidence-based behavioral interventions are deemed the most efficacious treatments, with many children benefitting from speech and occupational therapy.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Islamic Azad University.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis. The author contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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