Socioeconomic Factors and Clinical Characteristics Associated with Age at Autism Spectrum Disorder Diagnosis

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ABSTRACT

Objective: Investigate factors influencing autism spectrum disorder (ASD) diagnosis in children under and over 36 months, and determine the average age for ASD diagnosis at Charoenkrung Pracharak Hospital, Bangkok, Thailand, after implementing ASD screening.

Materials and Methods: A retrospective cross-sectional study of 252 children with ASD aged 1-15 years from 2014 to 2023, classified into ≤36 months (n=104) and >36 months (n=148) at diagnosis. Demographic, clinical data and child/family factors were analyzed using multivariate regression analysis.

Results: Mean age at ASD diagnosis was 44.77 ± 19.91 months. Attending well-baby clinics (aOR 2.64, p=0.038), higher family income ≥ 814 US dollars per month (aOR 2.33, p=0.020), and higher parental education (aOR 3.43, p=0.011) were significantly associated with diagnosis before 36 months. Hyperactivity as the main complaint (aOR 0.07, p=0.001) and global developmental delay/intellectual disability (aOR 0.45, p=0.023) predicted later diagnosis. Child's gender, being an only child, sibling order, and parental age had no significant impact.

Conclusion: Over half of all ASD diagnoses occurred after age 3, with an average age around 44 months. Regular attendance in well-child clinics allowing ASD screening, and higher socioeconomic status and parental education facilitated earlier diagnosis. In contrast, concerns about hyperactivity and global developmental delay often lead to delayed ASD assessment. Enhancing awareness of ASD among families with limited resources can promote timely diagnosis and access to intervention.

Keywords: Autism spectrum disorder; age at diagnosis; early intervention; screening; socioeconomic factors (Siriraj Med J 2024; 76: 589-594)

INTRODUCTION

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by persistent deficits in social communication and interaction, coupled with restricted, repetitive patterns of behavior, interests, or activities.[1] The prevalence of ASD has risen substantially in recent years, with the Centers for Disease Control and Prevention estimating 1 in 36 children identified with ASD in 2020, a notable increase from 1 in 68 children in 2010.[2] In Thailand, approximately 1 in 161 children under 5 years old are diagnosed with ASD, representing a 6-fold increase over the past decade.[3] As a lifelong condition, ASD poses significant challenges for public health systems, families, and economic resources.[1,4]

Early diagnosis and intervention for ASD during the first three years of life are crucial, as this period of

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Received 18 April 2024 Revised 9 May 2024 Accepted 20 May 2024
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https://doi.org/10.33192/smj.v76i9.268770

peak brain plasticity provides the greatest potential for positive developmental outcomes.[4,5] Numerous studies have shown that timely interventions can substantially improve long-term prognosis and mitigate financial and societal burdens associated with ASD.[4,6] While the average age of diagnosis has decreased from 10 years in the 1960s-1990s to around 4-5 years more recently[7], diagnostic delays persist due to the heterogeneous nature of ASD and variable clinical presentations.[8]

Understanding the factors influencing the timing of ASD diagnosis is critical to facilitating early identification and access to interventions. Previous research has linked certain characteristics of children, such as the severity of symptoms, intellectual disabilities, language delays, and regression, with earlier diagnosis.[6,9,10] Family factors such as socioeconomic status, levels of parental education, and having siblings with ASD have also been associated with age of diagnosis, although the findings remain inconsistent.[11-16]

Limited data exists on factors impacting the timing of ASD diagnosis in Thailand. Furthermore, Thailand currently lacks a comprehensive national policy for implementing ASD screening protocols. In 2014, the Charoenkrung Pracharak Hospital in Bangkok, Thailand, adopted the ASD screening protocols in a well-baby clinic recommended by the American Academy of Pediatrics.[17] The screening involved conducting the Modified Checklist for Autism in Toddlers (M-CHAT) during the 18 and 24-month well-child visits. The children who tested positive were referred for extensive evaluations by developmental-behavioral pediatricians who used DSM-5 criteria to diagnose ASD. This standardized screening enabled earlier identification of children requiring diagnostic assessments during routine well-child visits. Following the implementation of these ASD screening protocols, this study aimed to investigate child and family factors, including attendance at well-baby clinics with ASD screening protocols, that influenced the diagnosis of ASD in children under and over 36 months of age. Identifying factors associated with earlier versus later diagnosis can guide strategies to improve timely detection and intervention access for optimal outcomes.

MATERIALS AND METHODS

Study design and population

This study was conducted retrospectively to describe the characteristics of children aged 1-15 years diagnosed with ASD at the Autistic Child Center of Charoenkrung Pracharak Hospital between January 2014 and December 2023. Developmental-behavioral pediatricians diagnosed ASD according to the criteria specified in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5).[1]

Data collection

The medical records and evaluations performed by the attending physicians were used to collect demographic and clinical data for each participant. The following child factors were recorded: age at diagnosis of ASD, sex, chief complaint, comorbid conditions, number of siblings, birth order, history of siblings with ASD, and records of well-baby clinic visits to the hospital. In addition, the following family factors were recorded: parents' ages, parental education levels, and monthly family income, which determined the socioeconomic status.

Statistical analyses

This study employed descriptive statistics to describe the demographic characteristics of children with ASD and their family profiles by categorizing them into two groups based on their age at ASD diagnosis: before or after 36 months of age. The Chi-square test was used to establish the relationship between demographic characteristics and age at the time of diagnosis of ASD. The independent variables with statistical associations (p-value < 0.1) with age at the time of diagnosis of ASD were then selected for multivariate logistic regression analysis. Variables with an observed association of p-value < 0.05 in the multivariate logistic regression analysis were considered statistically significant. Data coding and entry were performed using Microsoft Excel. SPSS Statistics Program Version 26 was used for data analysis.

Ethical Considerations

The study was approved by the Human Research Ethics Committee of the Bangkok Metropolitan Administration (R006h / 64_EXP).

RESULTS

This study included a total of 252 participants, with a mean age at the time of diagnosis of 44.77 ± 19.91 months. Participants were classified into two groups: children older than 36 months (n=148) and those ≤36 months (n=104) at the time of diagnosis. The gender distribution was comparable between the two groups, with males representing 74.3% and 76.0% of the older and younger groups, respectively (Table 1).

As shown in Table 1, the chief complaints at the first visit differed significantly between the two groups. Delayed speech was more common among the younger group (83.7% vs 72.3%, p=0.037), while hyperactivity was more prevalent in the older group (23.0% vs 4.8%,

TABLE 1. Demographic characteristics of children with ASD before and after 36 months.

Demographic Characteristics	Total number of participants (n=252)	Descriptive results		p-value
		Younger age at diagnosis ≤ 36 months (n=104)	Older age at diagnosis > 36 months (n=148)	
Sex				0.768
Boy	189 (75.0)	79 (76.0)	110 (74.3)	
Girl	63 (25.0)	25 (24.0)	38 (25.7)	
Main Complaint at 1st Visit				
Delayed Speech	194 (76.9)	87 (83.7)	107 (72.3)	0.037*
Hyperactive	39 (15.5)	5 (4.8)	34 (23.0)	<0.001*
Others	20 (7.6)	12 (11.5)	8 (5.4)	0.101
Comorbidity				
ADHD	49 (19.4)	11 (10.6)	38 (25.7)	0.004*
GDD/ID	115 (45.6)	32 (31.1)	83 (56.5)	0.001*
Epilepsy	5 (1.9)	3 (2.9)	2 (1.4)	0.401
Well-baby clinic visits at the hospital				<0.001*
No	207 (82.1)	74 (71.2)	133 (89.9)	
Yes	45 (17.9)	30 (28.8)	15 (10.1)	
Number of children				0.073
Being an only child	130 (51.6)	61 (58.6)	69 (46.6)	
More than 1 child	122 (48.4)	43 (41.4)	79 (53.4)	
Birth order				0.155
Firstborn	158 (62.7)	71 (68.3)	87 (58.7)	
Other	94 (37.3)	33 (31.7)	61 (41.3)	
Positive siblings of ASD				0.811
No	238 (94.4)	99 (95.2)	139 (93.9)	
Yes	14 (5.6)	5 (4.8)	9 (6.1)	

Data presented as numbers (percentage)
Abbreviations: ADHD = Attention Deficit Hyperactivity Disorder, GDD = Global Developmental Delay, ID = Intellectual Disability
*Statistically significant with p-value ≤ 0.05

p<0.001). Furthermore, the older group had a higher prevalence of comorbid attention deficit hyperactivity disorder (ADHD) (25.7% vs 10.6%, p=0.004) and global developmental delay/intellectual disability (GDD/ID) (56.5% vs 31.1%, p=0.001). Well-baby clinic visits to the hospital were significantly more common among the younger group (28.8% vs 10.1%, p<0.001). Further exploration revealed that out of those who attended well-baby clinic visits, 14 (31.1%) screened positive on the ASD screening protocol, and all of them received an ASD diagnosis before 36 months of age. However, the number of children and the order of birth did not differ significantly between the groups.

As shown in Table 2, a higher proportion of children in the younger group had a family income ≥ 814 US dollars (74.1% vs. 55.4%, p=0.001) and a primary caregiver with compulsory education or higher (86.5% vs. 75.0%, p=0.019).

In Table 3, multivariate logistic regression analysis revealed that attending well-child clinics (adjusted odds ratio [aOR] 2.64, 95% CI 1.06-6.62, p=0.038), higher family income ≥814 US dollar (aOR 2.33, 95% CI 1.14-4.73, p=0.020), and higher levels of parental education (aOR 3.43, 95% CI 1.32-8.91, p=0.011) were significantly associated with an earlier diagnosis of ASD (≤36 months). On the contrary, hyperactivity as the main complaint

TABLE 2. Family profiles of children with ASD before and after 36 months.

Demographic Characteristics	Total number of participants (n=252)	Descriptive results Younger age at diagnosis ≤ 36 months (n=104)	Older age at diagnosis > 36 months (n=148)	p-value
Paternal age at child's birth				0.217
<35-year-old	97 (38.4)	47 (45.2)	50 (33.8)	
≥35-year-old	155 (61.6)	57 (54.8)	98 (66.2)	
Maternal age at child's birth				0.998
<35-year-old	137 (54.3)	58 (55.8)	79 (53.4)	
≥35-year-old	115 (45.7)	46 (44.2)	69 (46.6)	
Monthly family income				0.001*
<814 US dollars+	93 (36.9)	27 (25.9)	66 (44.6)	
≥814 US dollars+	159 (63.1)	77 (74.1)	82 (55.4)	
Parents' marital status				0.125
Married	189 (75.0)	83 (79.8)	106 (71.6)	
Divorce	63 (25.0)	21 (20.2)	42 (28.4)	
Primary Caregiver's educational level				0.019*
Below compulsory Education	51 (20.2)	14 (13.5)	37 (25.0)	
Compulsory education and higher	201 (79.8)	90 (86.5)	111 (75.0)	

Data presented as number (percentage)
+1 US dollar = 36.87 bahts

TABLE 3. Multivariate logistic regression analysis for the association between demographic characteristics and younger age at the time of ASD (≤ 36 months).

Demographic characteristics	Adjusted Odd Ratios	95% Confidence interval	p-value
Main Complaint at 1st Visit			
Delayed Speech	0.41	0.13, 1.28	0.125
Hyperactive	0.07	0.01, 0.35	0.001*
Comorbidity			
ADHD	0.65	0.25, 1.70	0.383
GDD/ID	0.45	0.23, 0.90	0.023*
Well-baby clinic visits at the hospital	2.64	1.06, 6.62	0.038*
Higher monthly family income (≥814 US dollars+)	2.33	1.14, 4.73	0.020*
Higher level of education (Compulsory education and higher) of the primary caregiver	3.43	1.32, 8.91	0.011*

Abbreviations: ADHD = Attention Deficit Hyperactivity Disorder, GDD = Global Developmental Delay, ID = Intellectual Disability
+1 US dollar = 36.87 bahts
*Statistically significant with p-value ≤ 0.05

(aOR 0.07, 95% CI 0.01-0.35, p=0.001) and the presence of GDD/ID (aOR 0.45, 95% CI 0.23-0.90, p=0.023) predicted a later diagnosis of ASD (>36 months).

DISCUSSION

The mean age at the time of ASD diagnosis in our study was 44.77 ± 19.91 months, which aligns with recent reports indicating that children are often diagnosed around 4 years of age.[2,18] Despite the early emergence of ASD symptoms within the first two years of life, diagnostic delays persist due to various factors, including limited awareness of developmental milestones, insufficient access to health services, and delays between initial referrals and specialist evaluations.

Our findings highlight the critical role of regular well-baby clinic visits in facilitating early ASD detection through standardized ASD screening protocols like the M-CHAT. This underscores the importance of implementing comprehensive developmental surveillance and ASD-specific screenings, as recommended by the American Academy of Pediatrics, to identify developmental delays and ASD at the earliest stages possible.[17,19]

Children with GDD / IDD may experience a delayed diagnosis of ASD. Early developmental delays can mask the social communication deficits and restricted/repetitive behaviors of ASD, leading to delayed recognition.[20] Healthcare providers need to be better trained to recognize the potential co-occurrence of ASD in children with GDD/ID and initiate timely diagnostic evaluations.

Hyperactivity as the main presenting concern was also associated with a later diagnosis of ASD, possibly due to the overlap of symptoms with ADHD.[21,22] This diagnostic challenge underscores the importance of considering ASD in young children with hyperactive behaviors, as early intervention is crucial for optimal outcomes.

Consistent with previous studies,[15,16] our findings indicate that higher socioeconomic status and parental education levels facilitated an earlier diagnosis of ASD. This may be attributed to increased awareness of ASD symptoms, better access to medical information and healthcare services, and greater advocacy for comprehensive evaluations. In contrast, families with limited resources and lower educational attainment can face barriers to the timely identification and diagnosis of ASD. Targeted efforts to enhance ASD awareness and improve access to screening and diagnostic services are essential to address these disparities.

Although previous research has suggested associations between factors such as having siblings with ASD, birth order, and age at diagnosis,[13,14,16] our study did not find significant relationships with these variables. These discrepancies may be attributable to differences in study populations, sample sizes, and methodologies employed.

It is important to acknowledge the limitations of our retrospective study design, which relied on medical record reviews and may have been subject to incomplete or missing data. Furthermore, the COVID-19 pandemic likely affected families' ability to seek medical attention, which could contribute to diagnostic delays during the study period.

These findings in our study underscore the importance of implementing comprehensive developmental surveillance and ASD screening protocols in well-baby clinics to facilitate early identification. Furthermore, increasing awareness of ASD and improving access to diagnostic services, particularly among families with limited resources, are crucial to promote timely diagnosis and intervention for children with ASD.

Future research should explore strategies to address socioeconomic disparities in ASD diagnosis and focus on developing educational initiatives and community-based programs to improve the recognition of ASD symptoms in diverse populations. Furthermore, longitudinal studies that examine the long-term outcomes of children diagnosed at different ages would provide valuable insights into the impact of early intervention on development and quality of life.

CONCLUSION

The average age of ASD diagnosis in this study was 44 months, with language delay serving as a common initial concern among parents. Regular attendance in well-child clinics that offer ASD screening, higher family income, and higher levels of parental education were associated with earlier ASD diagnosis. In contrast, concerns regarding hyperactivity and the presence of GDD/ID often led to delayed ASD assessments.

ACKNOWLEDGMENTS

The authors thank the participants in this study for their time.

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions

All authors approved the final article. The authors were involved with the study: SC: Conceptualization, Methodology, Investigation and data collection, Writing-Original draft. TA: Investigation and data collection. PW: Writing-Review and editing.

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