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Research Article

Prevalence of Anxiety Disorders in Chinese Children with Autism Spectrum Disorder in Hong Kong

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Abstract

Background: Autism spectrum disorder (ASD) is a pervasive neurodevelopmental disorder. Children with ASD are faced with various challenges considering their lifelong neurodevelopmental disabilities. Comorbid psychiatric disorders are found to be prevalent among children with ASD. Anxiety disorders are one of the most prevalent psychiatric comorbidities in this population and have been associated with debilitating psychosocial impairment.

Objective: This study aimed to examine the prevalence of comorbid anxiety disorders among Chinese school-age children diagnosed with ASD in a child and adolescent psychiatry outpatient clinic in Hong Kong.

Methods: This cross-sectional study was conducted at the Yaumatei Child and Adolescent Mental Health Service specialist outpatient clinic from August 2019 to April 2020. The sample consisted of one hundred thirty-two subjects aged 6 to <12 years who were diagnosed with ASD. The Developmental, Dimensional and Diagnostic Interview were administered to confirm the diagnosis of ASD. The National Institute of Mental Health Diagnostic Interview Schedule for Children-Version 5, parent version was administered for the assessment of comorbid anxiety disorders.

Results: The one-year prevalence rate of any anxiety disorder was 28.8%. The most common anxiety disorder was specific phobia (22.7%), followed by social anxiety disorder (13.6%), separation anxiety disorder (3.8%), generalized anxiety disorder (3.8%) and selective mutism (1.5%). No subjects were diagnosed with panic disorder or agoraphobia.

Conclusion: Anxiety disorders are prevalent among Chinese school-age children with ASD in Hong Kong. Early recognition and identification of comorbid anxiety disorders are necessary in the diagnostic process of ASD.

Keywords: Autism spectrum disorder; Anxiety disorder; Chinese children

Introduction

Autism spectrum disorder (ASD) is a pervasive neurodevelopmental disorder characterized by impairment in social communication and presence of restricted, repetitive patterns of behaviour, interests, or activities [1]. International and local epidemiological studies have indicated rising trends in the prevalence of ASD. A local epidemiological study revealed a steadily rising prevalence of ASD in Hong Kong Chinese children aged under 15 years, from an estimated prevalence rate of 1 per 10000 in 1986 to 30 per 10000 in 2005 [2]. The Centers for Disease Control and Prevention also revealed a similar trend in the United States, with growing community prevalence from 6.7 per 1000 in 2000 to 16.8 per 1000 in 2014 in children aged 8 years [3]. Children with ASD are faced with various challenges throughout their growth and development considering their lifelong neurodevelopmental disabilities. With the rising prevalence of ASD, there is growing awareness and interest in the field of research to examine the comorbid psychopathologies in this population. Comorbid psychiatric disorders are common among children with ASD; evidence has shown that anxiety disorders are one of the most prevalent psychiatric comorbidities [4-10]. Anxiety in children with ASD has been associated with debilitating psychosocial

impairments [11,12], conferring additional functional interference beyond the ASD-related functional deficits. It is important to establish an estimate of the local prevalence of anxiety disorders in children with ASD, as well as to explore the associated factors.

Objective

This study aimed to examine the prevalence of anxiety disorders in Chinese school-age children diagnosed with ASD in a child and adolescent psychiatry outpatient clinic.

Methods

This was a cross-sectional study examining the prevalence of anxiety disorders among Chinese school-age children diagnosed with ASD. This study was conducted at the Yaumatei Child and Adolescent Mental Health Service (YMTCAMHS) from August 2019 to April 2020. The YMTCAMHS is a regional specialist outpatient clinic serving children and adolescents under the age of 18 years in the Kowloon West and Kowloon Central Clusters of Hong Kong; these regions have a total population of 2.4 million, which is approximately one third of the total population in Hong Kong [13]. Potential eligible subjects were identified from an electronic database. Subjects were

selected *via* computer-generated simple random sampling. Written informed consent and assent were obtained from the subjects' parents and the subjects, respectively. All recruited subjects' parents were interviewed by the principal author with the Developmental, Dimensional and Diagnostic Interview (3Di) to confirm the subjects' diagnosis of ASD. The diagnosis of ASD was confirmed when all three subscale scores (reciprocal social interaction skills, language and communication skills, and repetitive and stereotyped behaviours) reached the diagnostic cut-offs. A further assessment was conducted on the same day using the Chinese version of the National Institute of Mental Health Diagnostic Interview Schedule for Children- Version 5 (NIMH DISC-5), parent version. Ethics approval was obtained from the Kowloon West Cluster Research Ethics Committee.

Subjects

Inclusion criteria:

- Age 6 to <12 years;

- Chinese ethnicity;

- ASD diagnosis determined by a psychiatrist and confirmed by the Developmental, Dimensional and Diagnostic Interview (3Di).

Exclusion criteria:

- Subject's parents were unable to comprehend Chinese

- Known severe mental illnesses, such as psychosis or mania

- Known intellectual disability

- Known severe neurological disorders or chromosomal abnormalities or severe medical disorders that required long-term treatment

- Active substance abuse

Measures

Developmental, Dimensional and Diagnostic Interview (3Di): The Developmental, Dimensional and Diagnostic Interview (3Di) are a standardized computer-based parent-report interview, developed and validated by Skuse and his colleagues [14]. The pervasive developmental disorder module of the 3Di is primarily designed to assess dimensions of autistic traits in children with normal intelligence. It generates dimensional scores on domains of qualitative abnormalities in reciprocal social interaction skills, qualitative impairments in language and communication skills, and repetitive and stereotyped behaviours, as well as categorical diagnosis. The 3Di has excellent test-retest and interrater reliabilities. The sensitivity and specificity were 1.0 and >0.97, respectively [14]. The translated Chinese version of the 3Di pervasive developmental disorder module has a sensitivity of 0.95 and specificity of 0.77 [15]. With the changes in the diagnostic criteria of ASD in the DSM-5 [1], Mandy and colleagues [16] tested the 3Di subscales using confirmatory factor analysis and concluded that the two-factor model of the DSM-5 was well represented in the 3Di.

National Institute of Mental Health Diagnostic Interview Schedule for Children, parent version (NIMH DISC): The National Institute of Mental Health Diagnostic Interview Schedule for Children (NIMH DISC) is a highly structured respondent-based diagnostic interview designed to assess psychiatric disorders in children and adolescents. There are a total of six modules assessing thirty-four common childhood psychiatric disorders upon a one-year timeframe. The interview has parallel parent and youth reported versions, designed for individuals in the age ranges of 6 to 17 years, and 9 to 17 years, respectively. The parent version was adopted in the present study as it is designed for children within the age range of our sample (6 to <12 years), as well as its better test-retest reliability than that of the youth version [17]. Multiple symptoms are assessed, and the scoring programme combines the symptom responses to determine whether a disorder criterion is fulfilled. Recommendations by the DISC Development Group are followed for the impairment criteria; an impairment score of three is considered to be clinically significant. Literature has supported the reliability and validity of the NIMH DISC, including a translated Chinese version for the use in Hong Kong [17,18], which has been widely adopted in local studies. Over the years, various versions of NIMH DISC have been generated to match the evolving classification systems. The latest version- NIMH DISC-5 was developed based on the DSM-5 classification [1].

Sociodemographic data

Through a structured questionnaire and subject's case record, information regarding the subject's sociodemographic background, medical and psychiatric history, schooling history, and bullying history, as well as the family's sociodemographic background and psychiatric history were obtained.

Sample size

Referencing overseas literature with study designs resembling the present study, specifically studies that were based on clinical samples and used standardized diagnostic interviews, the prevalence estimates of anxiety disorders among children with ASD ranged from 43.5% to 84.1% [19-22]. Taking the average value of 66% as the estimated prevalence with a 95% confidence interval (CI) and a 9% margin of error, the sample size required for the present study was estimated to be 107 subjects.

Data analysis

Statistical analysis was performed using the Statistical Program for Social Sciences 26.0 for Windows (SPSS Inc., Chicago, Illinois, USA computer software).

Results

A total of 150 subjects selected via computer-generated simple random sampling were invited to participate in the study. Of these subjects, 9 refused to participate due to time constraints and privacy concerns, and 9 failed to reach the diagnostic cut-offs of all three subscales in the 3Di. The final sample consisted of 132 subjects. Comparing the enrolled subjects with the subjects who did not participate in the study, no statistically significant differences in age, sex, or school year were found. The sample recruitment process is summarized in Figure 1.

Subject characteristics

The sample consisted of 115 boys (87.1%) and 17 girls (12.9%). The mean age of the subjects was 8.9 years (SD = 1.7). 69 subjects (52.3%) were diagnosed with comorbid ADHD as assessed by the NIMH DISC-5. 93 subjects (70.5%) had undergone intelligence assessments in the past, with either the Wechsler Preschool and Primary Scale
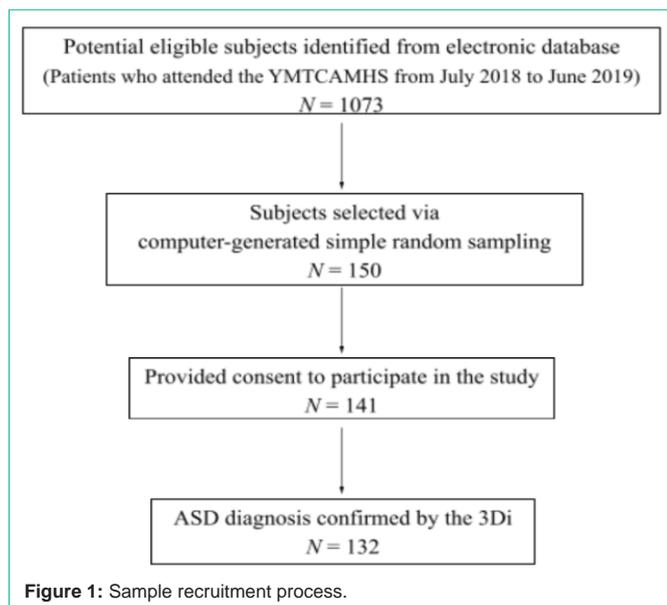
Figure 1: Sample recruitment process.

of Intelligence- Revised Edition, the Wechsler Intelligence Scale for Children- Fourth Edition (Hong Kong), or the Wechsler Intelligence Scale for Children- Fourth Edition (Hong Kong) short-form. All subjects with intelligence assessment performed had a Full Scale Intelligence Quotient of 70 or above. All subjects were educated in mainstream primary school.

Prevalence rates and patterns of comorbid anxiety disorders

The prevalence rates of anxiety disorders as assessed by the NIMH DISC-5 are summarized in Table 1. The one-year prevalence rate of any anxiety disorder was 28.8%. 15 subjects (11.4%) had two or more anxiety disorders. Specific phobia was the most common type of anxiety disorder, with a prevalence rate of 22.7%. The second most common type was social anxiety disorder, with a prevalence rate of 13.6%. The third most common types were separation anxiety disorder and generalized anxiety disorder, with prevalence rates of 3.8%. Selective mutism had a prevalence rate of 1.5%. No subjects were diagnosed with panic disorder or agoraphobia.

Discussion

The present study is the first local study examining the prevalence of anxiety disorders among school-age children with ASD using a diagnostic interview based on the DSM-5 classification [1]. Referencing the local community prevalence (6.9%) [23] and the worldwide community pooled prevalence (6.5%) of anxiety disorders in typically developing youth [24], our prevalence rate of any anxiety disorder (28.8%) echoes past literature that anxiety disorders are prevalent among children with ASD [25].

In agreement with the existing evidence [25], specific phobia was found to be the most prevalent anxiety disorder among children with ASD. Literature has shown that specific phobia is more prevalent among younger children [8], with a mean age of onset of 11.0 years [26]. Despite being one of the most prevalent childhood anxiety disorders, specific phobia is generally considered as relatively less debilitating than other anxiety disorders. In fact, specific phobia in

Table 1: One-year prevalence rates of anxiety disorders as assessed by the NIMH DISC-5.

	One-year Prevalence	
	N	**%**
Any Anxiety Disorder(s)	**38**	**28.8**
Single anxiety disorder	23	17.4
Two anxiety disorders	9	6.8
Three anxiety disorders	6	4.5
Social Anxiety Disorder	**18**	**13.6**
Separation Anxiety Disorder	**5**	**3.8**
Specific Phobia	**30**	**22.7**
Animals	6	4.5
The dark	11	8.3
Thunder and lightning	2	1.5
Loud sounds	7	5.3
Water	1	0.8
Needles	2	1.5
Others	1	0.8
Panic Disorder	**0**	**0**
Generalised Anxiety Disorder	**5**	**3.8**
Selective Mutism	**2**	**1.5**
Agoraphobia	**0**	**0**

childhood is strongly associated with a higher prevalence of comorbid internalizing disorders with greater severity, earlier age of onset and poorer long-term outcomes [27]. Given our findings and the current evidence, the clinical significance of specific phobia should not be underestimated in children with ASD. In the present study, no subjects were diagnosed with panic disorder and agoraphobia. Existing evidence has shown that panic disorder and agoraphobia are rare in childhood and adolescence [28]. The mean age of onset of panic disorder and agoraphobia were estimated to be 30.3 years and 21.1 years, respectively [26], which potentially explains our findings in a sample of school-age children. Within our sample, having multiple anxiety disorders was not uncommon; 15 (11.4%) subjects were diagnosed with more than one anxiety disorder, and 14 out of the 15 subjects had a diagnosis of specific phobia. Children with ASD and multiple anxiety disorders are bound to experience greater obstacles and impairment in their daily functioning. Early recognition of multiple anxiety disorders is important, as it is associated with greater long-term disabilities [29].

In comparison to the findings of a local community survey that yielded 33.8% of mild anxiety or above in school-age children with ASD [30], our prevalence rate of any anxiety disorder (28.8%) was slightly lower. Our lower prevalence was likely related to the adoption of a stringent measurement (NIMH DISC-5) for the diagnosis of anxiety disorder, whereas the community survey adopted the Beck Youth Inventories-for Children and Adolescents 2nd Edition for anxiety symptoms measurement only. Our prevalence rate was also found to be lower than most of the prevalence rates yielded from overseas studies that are based on clinical samples and older DSM versions [5,19-22,25], except one study that yielded a similar

prevalence rate of 28.9% [31].

Similar to the present study, two previous studies adopted the NIMH DISC as the diagnostic instrument for anxiety disorders [19,22]. Muris and colleagues [22] demonstrated a much higher prevalence of anxiety disorders among children with autistic disorder and pervasive developmental disorder-not otherwise specified (PDD-NOS) using the NIMH DISC-2.3, yielding a six-month prevalence rate of 84.1%. The NIMH DISC-2.3 was developed based on the DSM-III-R criteria [32], which preceded the introduction of the requirement of having clinically significant distress or functional impairment in establishing DSM psychiatric diagnoses. It has been reported that a substantial number of children who presented with anxiety are in fact functionally unimpaired [33]. Considering that the NIMH DISC-2.3 permitted diagnoses to be established based on symptom criteria alone, a higher prevalence rate is therefore expected. Furthermore, Muris and colleagues' [22] sample was much smaller in size and broader in age range (2 to 18 years) in comparison to ours. The inclusion of adolescents in their study could have contributed to their higher prevalence of anxiety disorders, as anxiety has been shown to increase with age in children with ASD [34]. Later, a study conducted by de Bruin and colleagues [19] examining the prevalence of anxiety disorders in children with PDD-NOS yielded a one-year prevalence rate of 55.3%, using the NIMH DISC-IV, parent version, developed based on the DSM-IV. The introduction of the impairment criteria in DSM-IV has increased the diagnostic threshold in comparison to older DSM versions, which could have contributed to de Bruin and colleagues' [19] lower prevalence rate than that observed by Muris and colleagues [22] (84.1%). However, the prevalence reported by de Bruin and colleagues [19] remained higher than that in the present study (28.8%). In comparing the results, it is worth noting the differences in sample characteristics, such as their focus on subjects with PDD-NOS, as well as inclusion of subjects with FSIQ <70. Furthermore, obsessive-compulsive disorder (OCD) was included into their prevalence of anxiety disorders [19], while OCD was not regarded as an anxiety disorder in present study based on the DSM-5 classification [1].

Disparities in prevalence rates are seen across studies. There are a few potential explanations. First, the subject characteristics varied across studies; for instance, a substantial number of studies recruited subjects of a wide age range, whereas our study focused only on school-age children. The adoption of different age ranges could influence the predominance of the types of anxiety disorders, as systemic age differences are noted in the expression of anxiety symptoms [35]. Second, different instruments have been used to diagnose anxiety disorders across studies. To date, there is still a lack of standardization and consensus in the measurement of anxiety in children with ASD. Third, the changes in the diagnostic system over time could impact the prevalence of anxiety disorders. Modifications have been made to the classification of anxiety disorders in the DSM-5; separation anxiety disorder and selective mutism are newly included into the classification of anxiety disorders, while OCD and post-traumatic stress disorder are relocated into the classifications of obsessive-compulsive and related disorders and trauma- and stressor-related disorders, respectively [1]. The prevalence of anxiety disorders could therefore vary, depending on the version of the diagnostic system used. Finally, cultural factors may have contributed to our lower prevalence rate in comparison to overseas studies. In traditional Chinese families, strong emotionality is often underplayed; open expression or discussion of emotion is generally not encouraged. Traditional Chinese parents seldom explicitly discuss emotions with their children [36], and vice versa. In comparison to Western families, Chinese parent-child dyads tended to employ a relatively low elaborative conversational style [37]. Given the uniqueness of traditional Chinese culture, Chinese parents may demonstrate a lower sensitivity and awareness of their children's emotions than Western parents. Moreover, children growing up in traditional Chinese families that are emotionally restrictive may be more reserved in expressing their own emotions. Considering the above, underreporting of anxiety symptoms is possible, leading to a potential underestimation of the prevalence rate.

The present study has several strengths. First, computer-generated simple random sampling was adopted to minimize sampling bias. Second, the adoption of a sample with a narrow age range allowed focused examination of the clinical profile of anxiety disorders in school-age children with ASD. Third, the study had a high response rate of 94%, and a relatively large sample size in comparison to previous studies. Fourth, highly structured diagnostic interviews were used to establish the diagnoses of ASD and anxiety disorders, providing results with high diagnostic validity and reliability. Finally, this was the first local study examining the prevalence of anxiety disorders in children with ASD based on the DSM-5 diagnostic criteria [1].

The findings should be interpreted in the context of the following methodological limitations. First, the sample was recruited from a child and adolescent psychiatry outpatient clinic. Selection bias was potentially introduced, and the sample may not be a true representation of all children with ASD. Second, the assessments with 3Di and NIMH DISC relied solely on parents as informants, introducing potential informant bias. Without information from other informants, the results may be an incomplete reflection of a child's condition. Finally, this study lacked a control group. It would be highly beneficial for future studies to include controls to allow direct comparison of the prevalence and pattern of anxiety disorders between children with ASD and typically developing children.

Conclusion

Anxiety disorders are prevalent among Chinese school-age children with ASD in Hong Kong. This study enriches our understanding of the local prevalence of anxiety disorders in this population. Early recognition and identification of comorbid anxiety disorders are necessary in the diagnostic process of ASD. The findings of the present study provide an important next step in the development of local services for children with ASD and comorbid anxiety disorders. Standardization of assessment and establishment of effective intervention programmes are imperative. For future research directions, furthering our understanding of the aetiological pathways, associated factors, and disease outcome of anxiety disorders in children with ASD is of utmost importance.

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