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Neuropsychiatric comorbidities and associated factors in 182 Chinese children with tic disorders

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Abstract

Objective Tic disorders (TD) often present with associated neuropsychiatric comorbidities. This study aims to examine the clinical manifestations of TD in pediatric patients and explore the spectrum and features of neuropsychiatric comorbidities among Chinese children diagnosed with TD.

Methods A retrospective analysis was conducted on pediatric TD cases newly diagnosed at our institution, using the Mini International Neuropsychiatric Interview for Children and Adolescents 5.0 to screen for comorbidities. Furthermore, a statistical analysis of clinical features was undertaken.

Results The study enrolled 182 patients, comprising 140 males and 42 females. The diagnoses were distributed as follows: 65 cases of provisional TD, 29 cases of chronic TD, and 88 cases of Tourette syndrome. 94 (51.65%) patients presented with at least a single neuropsychiatric comorbid, while 40 (21.98%) patients exhibited two or more such comorbidities. TD is most frequently comorbid with attention-deficit hyperactivity disorder (33.52%, 61/182), oppositional defiant disorder (11.00%, 20/182) and current/previous manic/hypomanic episode (7.69%, 14/182). Children with comorbidities, compared to those without, experienced delayed diagnosis ($P=0.039$), were more prone to developing vocal tics (simple vocal tics $P=0.030$, complex vocal tics $P<0.001$), lacked sibling companionship ($P=0.030$), and exhibited more severe tics ($P=0.008$). The prevalence of comorbidities was notably higher in children from single-parent households (93.3%) compared to those in two-parent families ($P=0.006$). Individuals with multiple comorbidities had delayed diagnosis ($P=0.013$), and notably experienced more triggering psychological factors such as pressure, anxiety, and anger. Sex, parents' educational backgrounds and severity of tics significantly related to specific comorbidity occurrence.

Conclusion We identified several factors associated with comorbidities in children with TD, which aiding doctors in recognizing the comorbidities that require attention. Simultaneously, these factors help guide family members in providing targeted education that supports the physical and mental development of affected children.

Keywords Tic disorders, Tourette syndrome, Evaluation, Neuropsychiatric comorbidities, Attention-deficit hyperactivity disorder

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Introduction

Tic disorders (TD) are common pediatric neurodevelopmental disorders [1]. TD are involuntary and stereotyped phenotypes, characterized by "sudden, rapid, recurrent, nonrhythmic movements or vocalizations" [2]. Tics are categorized into motor and vocal tics based on quality and characteristics [3]. Motor tics most frequently involve the eyes, mouth, neck, limbs, feet, and midline axial structures. Vocal tics are produced by contraction of the vocal cords and the nasal, oral, laryngeal, pharyngeal, and respiratory muscles [4]. Tics usually start between 4–8 years of age, with an average age of onset of 6 years, with a higher proportion in males, peak in severity at 10–12 years, gradually decrease later, and partly resolve in late adolescence and young adulthood [5]. Based on the clinical manifestations and duration of symptoms, individuals are categorized into provisional tic disorders (PTD), persistent chronic motor or vocal TD (CTD), and Tourette syndrome (TS). Both TS and CTD involve tics lasting for more than a year, with TS patients typically experiencing more severe tics and additional comorbidities compared to others [6]. Previous research has reported prevalence rates of 1.7% for PTD, 1.2% for CTD, and 0.3% for TS [7]. However, diagnosis can be challenging as some patients refrain from seeking medical evaluation [8, 9]. The precise etiology of TD remains unknown, although it is widely accepted that multiple factors, including polygenic, immune, and environmental factors, play important roles in the diverse clinical manifestations [10]. Environmental factors like perinatal complications, infections, and psychosocial stress are believed to elevate the susceptibility to TD [11]. Neurologic examinations of TD patients typically yield normal results; however, "soft" neurologic findings may still be present, including coordination issues, synkinesis, and motor restlessness [12]. More than half of individuals with TS exhibit at least one psychiatric comorbidity, including attention-deficit hyperactivity disorder (ADHD), obsessive-compulsive behavior/disorder (OCB/OCD), anxiety disorders, depression, and others [7]. These comorbidities not only height the complexity and severity of the condition but also significantly impact patients' cognitive, social, and emotional development, posing challenges to treatment and management strategies. Despite the high prevalence and significant impact of comorbidity, limited research is available on the factors related to occurrence.

Currently, the diagnosis, assessment, and treatment of children with TD in China primarily depend on a limited number of pediatric neurologists and general pediatricians. There is a lack of a structured referral system to enable patients to access different healthcare facilities [7]. This fragmented approach poses challenges in executing standardized diagnostic and treatment protocols, particularly in accurately gauging the disease severity and assessing neuropsychiatric comorbidities, thereby impacting the formulation of better treatment strategies. This study aims to outline the clinical presentations and comorbid features of newly diagnosed TD children to enhance insights into the status of TD patients in China, which is pivotal for improving diagnosis and treatment outcomes.

Materials and methods

Subjects

A total of 235 cases were enrolled from June 1, 2022, to September 30, 2023, at the Department of Pediatrics, the China-Japan Friendship Hospital. We conducted a retrospective analysis of 182 pediatric cases, all initially diagnosed with TD based on the criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders Version 5 (DSM-5) .

Methods

The inclusion criteria included patients diagnosed with TD meeting the criteria outlined in the DSM-5. Exclusion criteria involved 53 cases that did not meet the DSM-5 tic disorder criteria or exhibited secondary tic symptoms from organic conditions, medications, or other medical interventions. This study was approved by the Ethics Committee of China-Japan Friendship Hospital (approval No. 2022-KY-045) and was performed under the ethical principles of the 1964 Declaration of Helsinki and its later amendments. Written informed consents were obtained from all study participants' parents or other legal guardians. Patients were grouped based on the presence of neuropsychiatric comorbidities, sibling status, sex, parental education levels, and severity assessed using the Yale Global Tic Severity Scale (YGTSS) by certified pediatricians and neuropsychologists following the approved study protocol.

YGTSS is a semi-structured clinical interview designed to assess the severity of motor and vocal tics over the week preceding the patient's visit. It evaluates five dimensions: quantity, frequency, intensity, complexity, and degree of interference. Additionally, children with TD are assessed for functional impairments in self-esteem, social interaction, learning, or work performance. The total YGTSS score ranges from 0 to 100 and is derived by summing scores for motor tics (0–25), vocal tics (0–25), and dysfunction (0–50) [13]. TD cases with a total YGTSS score below 25 are classified as mild; those scoring between 25 and 50 are considered moderate; while score exceeding 50 indicate severe TD [7]. The evaluation process involves parental descriptions alongside a pediatrician conducting a detailed medical history review and observing the child during an office visit.

Criteria for evaluation

The comprehensive data were collected using a questionnaire(Supplementary Material 1) comprising personal history factors like sex, gestational age, pregnancy complications, neonatal conditions, infant feeding practices, chronic health issues, and hereditary diseases among first-degree relatives. Additionally, the clinical assessment including parameters such as psychological factors, premonitory urges, attack frequency, and neurological signs (pronation-supination, finger-to-nose, finger-pointing tests, and walking in a straight line) was collected. When conducting the pronation-supination test with the children, we instruct them to sit at a table, placing their hands flat on the surface with palms facing down and thumbs hanging over the edge. The children are then asked to perform a hand-flipping motion while gradually increasing the speed of this action. A positive result is indicated if the children's elbow swing more than an arm's width apart and if the hands flipping appears clumsy or uncoordinated.To refine the finger-to-nose test, we first have the child abduct one upper limb and accurately point to his nose using the index finger of his left hand followed by his right hand. This should be done progressively faster, repeating each action ten times with both eyes open and closed. A positive result is noted if there are any reductions in speed or issues with posture during this task.For the finger-pointing test, we ask the child to touch each fingertip in succession using his thumb as quickly as possible before repeating this action with his other hand. If he is unable to complete this task successfully, it is considered positive. Finally, when assessing walking in a straight line, we instruct the patients to walk along a straight path. A positive outcome occurs if they stagger or deviate from that line while walking [14].

Demographic details encompassed the age of tic onset, age at diagnosis, tic symptomatology, the time gap between onset and diagnosis, parental education levels, and sibling status. Initial assessments utilized the Combined Raven Test to evaluate intellectual abilities and the Chinese version of YGTSS to assess tic severity. Pediatricians utilized DSM-5 criteria to screen for neuropsychiatric comorbidities using the Chinese edition of the Mini International Neuropsychiatric Interview for Children and Adolescents 5.0 (MINI-KID 5.0) [15], with each positive diagnosis signaling the presence of comorbidity in a 30 to 60-minute session.

Statistical methods

A database was constructed using Excel 2010 software for entering and cross-verifying the data. Statistical analysis was conducted through SPSS 23.0 software. Demographic features of the participants and evaluation scale scores were subjected to descriptive analysis. Univariate assessment of clinical characteristics utilized the Pearson chi-square test, while analysis of continuous variables involved variance homogeneity testing through analysis of variance (ANOVA); in cases where ANOVA assumptions were not met, the Kruskal-Wallis rank-sum test was applied. Group comparisons were made utilizing Dunnett's T3 method. We conducted stratified analyses to examine the associations between "the presence or absence of comorbidities" and "presence or absence of siblings" using the Mantel–Haenszel χ^2 test, with "being from a single-parent family or not" as a stratification factor. Additionally, we applied an analogous approach to assess "sex" and "sibling presence" among ADHD patients presented in Table 3. All P values reported in this paper have been adjusted using Benjamini and Hochberg's linear step-up procedure to control for False Discovery Rate (FDR).Results with a significance level of adjusted $P<0.05$ were considered statistically significant.

Results

Patient characteristics

To understand the demographic and clinical overview of the study cohort, clinical data, familial backgrounds, and records of comorbidities in children diagnosed with TD were collected to conduct an in-depth analysis of the clinical characteristics and factors influencing comorbidity. Among the enrolled children with TD, the male-to-female ratio was 3.33:1, with ages ranging from 2.5 to 17 years. The average age of tic onset was 6.55 years (range, 2.00-14.58), with a median onset age of 6.38 years. The average age at TD diagnosis was 8.54 years (range, 2.94–16.11), and the median age was 8.32 years.In terms of cultural background, most participants were primary school students (77.47%, 141/182), followed by a smaller number who were preschool children (14.84%, 27/182) and junior high school students (7.69%, 14/182). The educational attainment level for both parents predominantly consisted of bachelor's degrees (48.9% for fathers and 54.95% for mothers), followed by graduate degrees (30.22% for fathers and 24.73% for mothers). We found a relatively short lag time between the observation of tic symptoms by family members and the initial diagnosis, with an average duration of 1.99 years. Additionally, 10 (5.49%) were premature infants, 8 (4.4%) had neonatal asphyxia, 15 (8.24%) belonged to single-parent families, 151 (82.97%) experienced psychological factors, 104 (57.14%) had premonitory urges, and 141 (77.47%) exhibited abnormal neurological "soft "findings (Table 1). Initial diagnoses included 65 (35.71%) with PTD, 29 (15.93%) with CTD, and 88 (48.35%) with TS. 51.65% (94/182) had one or more neuropsychiatric comorbidities. TD is most frequently comorbid with ADHD (33.52%, 61/182), oppositional defiant disorder (11.00%, 20/182), current/previous manic/hypomanic episode (7.69%, 14/182),

Table 1 Clinical data of patients

		Number of patients ($n=182$)
Sex	Male	140(76.92%)
	Female	42(23.08%)
Age (years) at symptom onset, mean ± standard deviation		6.55 ± 2.27
Age (years) at diagnosis, mean ± standard deviation		8.54 ± 2.41
Time interval (years) between symptom onset and diagnosis, mean ± standard deviation		1.99 ± 1.81
Subtypes of tic disorder	Provisional tic disorder	65(35.71%)
	Chronic motor or vocal tic disorder	29(15.93%)
	Tourette syndrome	88(48.35%)
Ratio of neuropsychiatric comorbidities		94(51.65%)
	Attention-deficit hyperactivity disorder	61(33.52%)
	Oppositional defiant disorder	20(11.00%)
	current/previous manic/hypomanic episode	14(7.69%)
	Panic attacks	11(6.04%)
	Anxiety disorder	9(4.95%)
	Separation anxiety	9(4.95%)
	Specific phobia	9(4.95%)
	Agoraphobia	7(3.85%)
	Obsessive-compulsive behavior / disorder	7(3.85%)
	Dysthymia	6(3.30%)
	Conduct disorder	5(2.75%)
	Learning disorder	5(2.75%)
	Depression	4(2.20%)
	Adjustment disorder	2(1.10%)
	Psychotic symptoms	2(1.10%)
	Anorexia nervosa	1(0.55%)
	Emotional disorders with psychotic symptoms	1(0.55%)
	Posttraumatic stress disorder	1(0.55%)
Fathers' educational background	Bachelor degree	89(48.90%)
	Graduate degree	55(30.22%)
	Others	38(20.88%)
Mothers' educational background	Bachelor degree	100(54.95%)
	Graduate degree	45(24.73%)
	Others	37(20.33)
Presence of siblings		63(34.62%)
	Unspecified	11(6.04%)
YGTSS at diagnosis	< 25	114(62.64%)
	25–50	64(35.16%)
	> 50	4(2.20%)
	mean ± standard deviation	22.57 ± 11.53
Combined Raven Test	mean ± standard deviation	111.81 ± 11.83 ($n=150$)
Neurologic "soft" findings (abnormal)		141 (77.47%)

panic attacks (6.04%, 11/182), anxiety disorder (4.95%, 9/182), specific phobia (4.95%, 9/182) and OCB/OCD (3.85%, 7/182) (Table 1). In our study, over half of individuals with TD exhibited at least one neuropsychiatric comorbidity. We aimed to identify the factors associated with these comorbidities in children with TD, as well as to determine the specific considerations that physicians should prioritize for this population.

Variations in the clinical characteristics of comorbidities

A univariate assessment of clinical characteristics was then conducted in two groups of patients with and without comorbidities to investigate the observed differences, revealing significant results as detailed in Table 2. Children with comorbidities exhibited delayed initial diagnosis ($P=0.039$), an increased likelihood of experiencing vocal tics during the disease course (simple vocal tics $P=0.030$; complex vocal tics $P<0.001$), absence of

Table 2 Univariate analysis of the presence of neuropsychiatric comorbidities

Patient characteristics		Number of Patients with neuropsychiatric comorbidities($n=94$)	Number of patients without neuropsychiatric comorbidities($n=88$)	*P* value	Adjusted *P* value
Sex	Male	75(79.79%)	65(73.86%)	0.343	
	Female	19(20.21%)	23(26.14%)	0.343	
Subtypes of tic disorder	Provisional tic disorder	28(29.79%)	37(42.05%)	0.223	
	Chronic motor or vocal tic disorder	16(17.02%)	13(14.77%)	0.223	
	Tourette syndrome	50(53.19%)	38(43.18%)	0.223	
Age (years) at symptom onset, mean ± standard deviation		6.76 ± 2.40	6.33 ± 2.10	0.202	
Age (years) at diagnosis, mean ± standard deviation		8.90 ± 2.31	8.16 ± 2.47	0.039	0.039
Time interval (years) between symptom onset and diagnosis, mean ± standard deviation		2.14 ± 1.80	1.84 ± 1.81	0.252	
Simple motor tics		89(94.68%)	83(94.32%)	1.000	
Complex motor tics		34(36.17%)	26(29.55%)	0.342	
Simple vocal tics		69(73.40%)	50(56.82%)	0.019	0.030
Complex vocal tics		22(23.40%)	4(4.55%)	0.000	0.000
	Repeating words or sentences	14(14.89%)	1(1.14%)	0.001	0.006
	Echolalia	8(8.51%)	0(0.00%)	0.015	0.028
	Coprolalia	13(13.83%)	3(3.41%)	0.013	0.029
YGTSS at diagnosis	< 25	52(55.32%)	62(70.45%)	0.035	0.042
	≥ 25	42(44.68%)	26(29.55%)	0.035	0.042
	mean ± standard deviation	25.00 ± 12.03	19.98 ± 10.40	0.003	0.008
Combined Raven Test	mean ± standard deviation	109.94 ± 17.26($n=83$)	114.13 ± 20.51($n=67$)	0.176	
Presence of siblings		25(26.60%)	38(43.18%)	0.019	0.030
Single-parent families		14(14.89%)	1(1.14%)	0.001	0.006

siblings ($P=0.030$), and higher YGTSS scores indicating more severe tics ($P=0.008$). These children often manifested speech repetitions, echolalia, or coprolalia, distinct from those without comorbidities. Notably, 93.3% of children from single-parent households displayed comorbidities, a considerably higher rate than in dual-parent families ($P=0.006$). When patients have siblings, the proportion of those with comorbidities who come from single-parent families is not statistically significantly elevated ($P=1.000$). Conversely, among patients without siblings, the proportion of those from single-parent families exhibiting comorbidities is significantly higher compared to their counterparts from two-parent families ($P=0.023$). No significant differences were observed in comorbidity ratio concerning sex, clinical categorization, age of onset, duration between onset and diagnosis, likelihood of motor tics, or scores on Combined Raven Test.

An in-depth analysis of differences among patients with one or more comorbidities revealed significant outcomes: Compared to children with a single comorbidity, those with multiple comorbidities (40, 21.98%) experienced delayed initial diagnosis ($P=0.013$) and notably reported more triggering psychological factors such as pressure, anxiety, and anger ($P=0.016$, $P=0.015$, $P=0.013$, respectively). A history of previous vomiting was significantly associated with multiple neuropsychiatric symptoms ($P=0.03$). Sex, clinical classification, age of onset, duration between onset and diagnosis, likelihood of motor or vocal tics, YGTSS score, presence of siblings, single-parent family status, and parents' educational background did not correlate with the ratio of multiple neuropsychiatric comorbidities.

Factors affecting comorbidities

The examination of factors influencing comorbidities in children with TD (Table 3) revealed that patients without siblings were more prone to experiencing neuropsychiatric comorbidities. Male patients exhibited a higher tendency to have comorbid ADHD ($P<0.05$). Patients with fathers holding graduate degrees were more susceptible to exhibiting OCB/OCD ($P=0.05$), and those with mothers having graduate degrees were more predisposed to current/previous manic/hypomanic episode ($P=0.036$). Additionally, patients with moderate to severe YGTSS scores (≥25) were more likely to suffer from oppositional defiant disorders ($P<0.001$) compared to those

Table 3 Factors affecting comorbidities in TD children

Comorbidities	Factors		
Attention-deficit hyperactivity disorder	No presence of siblings($n=108$)	Presence of siblings($n=63$)	*P* value
	48(44.44%)	12(19.05%)	0.001
	Male($n=140$)	Female($n=42$)	
	53(37.86%)	8(19.05%)	0.024
Obsessive-compulsive behavior / disorder	Fathers had gotten Bachelor degree($n=89$)	Fathers had gotten graduate degree($n=55$)	
	1(1.12%)	4(7.27%)	0.05
current/previous manic/hypomanic episode	Mothers had gotten Bachelor degree($n=100$)	Mothers had gotten graduate degree($n=45$)	
	4(4.00%)	7(15.56%)	0.036
Oppositional defiant disorder	YGTSS < 25 ($n=114$)	YGTSS ≥ 25 ($n=68$)	
	5(4.39%)	15(22.06%)	0.000

with milder scores. However, sex, parental educational background, and the presence of siblings did not show significant associations with the occurrence of specific comorbidities.

Discussion

TD is a prevalent neuropsychiatric condition in children [16]. Clinical features, including tic symptom characteristics and severity, are typically obtained from medical history and recorded videos of tics by parents or caregivers. Consequently, clinicians can readily establish a TD diagnosis. The severity of tics and comorbidities in TD children are strongly influenced by familial background and quality of life [17]. The detection of comorbidities requires prolonged interviews and in-depth communication with both parents and patients, which is particularly difficult within the constraints of limited clinical visits. This study specifically highlights the significance of comorbidities and presents a thorough examination of comorbid conditions. The study conducted an initial comprehensive screening using MINI-KID 5.0 to assess neuropsychiatric comorbidities in children diagnosed with TD in China, alongside an investigation into the contributing factors. Our findings indicate that children with comorbidities received their diagnoses at a later stage compared to those without comorbidities. Additionally, children with multiple comorbidities experienced delayed diagnoses compared to those with only one comorbidity. These results imply that as TD progresses, children have an increased likelihood of developing comorbidities, with a higher incidence of multiple comorbidities. Children with comorbidities have a higher likelihood of experiencing vocal tics compared to those without comorbidities. Therefore, physicians should give particular consideration to the comorbidity status of these children during the diagnosis process. Early diagnosis is crucial for facilitating a comprehensive assessment of comorbidities in TD, enabling ongoing long-term follow-up, timely interventions, and ultimately enhancing quality of life [18]. To investigate whether comorbidities were associated with four positive neurological signs in patients with TD, we conducted physical examinations. However, our analysis revealed no statistically significant differences in neurologic findings between patients with comorbidities and those without.

Tic symptoms alone do not typically impair social, behavioral, or emotional functioning, neuropsychiatric comorbidities have a more significant negative impact on a patient's quality of life and overall psychosocial functioning than tics [4, 19]. More than half of the children in this study had neuropsychiatric comorbidities, we found TD is most frequently comorbid with ADHD (33.52%), oppositional defiant disorder (11.00%), current/previous manic/hypomanic episode (7.69%) in Chinese patients. The above results are different from the previous literature, which suggests that OCB/OCD is present in approximately 50% of patients with TD [7]. The low proportion of OCB/OCD in our patient cohort may be attributed to several factors: The patients included in this study are relatively young. A previous study [20] identified a trend indicating that OCD typically begins between the ages of 10 and 12, while TD shows a marked decline after age 12, underscoring the importance of long-term follow-up. In our research, the mean age at diagnosis for TD patients was 8.54±2.41 years, whereas for TS patients it was 9.04±2.34 years; thus, the primary population within our sample does not fall into the high-incidence age group for OCB/OCD. This observation suggests that cross-sectional studies have inherent limitations and highlights the necessity for longitudinal follow-up to obtain more accurate prevalence estimates. Additionally, this phenomenon may reflect characteristics specific to the Chinese TD patient population. Previous literature [21] from Hunan Province, China reported that among 1772 TD patients screened with MINI-KID 5.0 by psychiatrists, only 9.52% were diagnosed with OCB/OCD; notably, these individuals had a mean age of 11.56±5.12 years at assessment. However, even in this context, the proportion did not reach the typical range of 25–33% observed in most TS cohorts. Children with TD

who have been screened for comorbidities must receive a clear diagnosis regarding conditions such as ADHD and OCD, followed by the development of appropriate pharmacological and behavioral interventions during the follow-up treatment process. Current/previous manic/hypomanic episode was classified under bipolar disorders (BD) according to DSM-5 [22]. As noted, within our study cohort, the proportion of patients with TD who also presented with comorbid "current/previous manic/hypomanic episode" (i.e.,BD) was recorded at a notable rate of 7.69%. The substantial symptomatic overlap between ADHD and BD, including irritability, hyperactivity, excessive talking, and distractibility [23], has been documented. In our study, we found that the prevalence of "current/previous manic/hypomanic episode" (i.e.,BD) among TD patients with ADHD was significantly higher at 14.75% (9/61) compared to their counterparts without ADHD at 4.13% (5/121) ($P=0.017$). The majority of patients identified as having a "current/previous manic/hypomanic episode (i.e.,BD)" in this study were those diagnosed with both TD and ADHD. This discovery sheds light on the increased prevalence of "current/previous manic/hypomanic episode" cases observed among TD patients. Previous literature has highlighted a low prevalence of BD among individuals with TD [24, 25]. Nevertheless, in recent years, there have been scarce studies focusing on the precise prevalence rates of BD in TD patients, whether with or without concurrent ADHD diagnoses. It is essential to initiate extensive longitudinal follow-up investigations and thorough research on individuals with TD who display symptoms associated with "current/previous manic/hypomanic episode". Employing larger sample sizes is crucial for enhanced trend analysis accuracy. It is important to acknowledge that this study is of a cross-sectional design, and the limited sample size imposes a constraint. The Sinicized adaptation of MINI-KID 5.0 demonstrates efficacy as a screening instrument to detect potential occurrences of "current/previous manic/hypomanic episode" in individuals with TD. Nonetheless, its interview content is somewhat limited, potentially introducing screening bias and lowering the positive predictive value. Children identified with "current/previous manic/hypomanic episode" in our study necessitate additional evaluation by psychiatrists through comprehensive interviews and observations.

Several studies have found that children with comorbidities exhibit more pronounced family-related factors. A separate study indicated that a low level of maternal involvement reported by mothers was linked to a higher risk of relapse of manic episodes in children [26]. Family dynamics, including poor disciplinary practices, family discord, and single-parent households, significantly relate to resistance disorders [27]. Previous research conducted on a cohort of over 600 Chinese TD patients demonstrated that children from nuclear families, as opposed to extended families, exhibited a higher susceptibility to TD. Nuclear families are a predominant family structure in China. A nuclear family consists of an adult man and an adult woman who are either married or in a relationship, or it may refer to a single parent living with dependent children. In contrast, an extended family includes a nuclear family cohabiting with other relatives such as grandparents, great-grandparents, aunts, uncles, and cousins [28].They found a harmonious parental relationship acted as a key protective factor, while parental discord notably elevated the risk of children developing TD [29]. In our study, we found that children who are only children exhibited a higher likelihood of comorbidities. Furthermore, when these children came from single-parent families, the probability of comorbid conditions increased even more. This suggests that familial background not only influences the development of developmental TD but also plays a significant role in the emergence of comorbid conditions.While the entire cohort included only 15 patients from single-parent families, this represents a relatively small sample size. Future studies with larger sample sizes are necessary to validate these findings. Research conducted by Hosokawa et al. revealed that lower maternal education was predictive of externalizing and behavioral issues, while paternal education did not demonstrate a significant association [17]. However, we identified a positive association between the educational attainment of fathers and the likelihood of developing OCB/OCD among children. We observed a similar trend for children with mothers who had higher education degrees and their susceptibility to experiencing current/previous manic/hypomanic episode. All findings presented are statistically significant, and there have been no analogous reports in prior literature. Nonetheless, it remains essential for future studies with larger sample sizes to confirm whether a definite correlation exists between these factors without other confounding influences. The educational backgrounds of parents play a critical role in shaping children's upbringing, contributing to a range of psychological and behavioral challenges.

Notably, Children with tics that are more severe, complex, or persistent often face challenges when engaging in social activities. They may receive criticism from their family members and may be perceived as withdrawn and unpopular among their peers [30]. Among the enrolled TD patients, 62.64% (114/182) exhibited moderate to severe tics while 37.36% (68/182) presented with mild tics. Our study indicates that moderate to severe tic presence significantly increases the risk of comorbidities, particularly behavioral problems. Children with YGTSS scores indicating moderate to severe tic severity were significantly more likely to exhibit oppositional defiant disorders ($P<0.001$) compared to those with milder scores.

These difficulties can contribute to the development of oppositional defiance disorders. Parents, teachers, and classmates need to create a more tolerant and encouraging environment for these children, providing greater understanding, support, and assistance in nurturing their self-confidence. When faced with the aforementioned situation, doctors need to identify the specific comorbidities that require attention. Simultaneously, they should guide family members in delivering targeted education that supports the physical and mental development of children with illnesses.

This study has several limitations that should be addressed in future research. Firstly, The sample size of this study was relatively small, comprising a total of 182 patients. Consequently, some results may not accurately represent the overall population despite demonstrating statistical significance; therefore, larger sample studies are necessary to validate these findings. Secondly, The study included fewer female patients, with a male-to-female ratio of approximately 3.33:1. This discrepancy is primarily attributed to the differing incidence rates of TD among males and females, resulting in insufficient representation of the female patient population in our research.Thirdly, The geographical scope of this article is confined to China, with all participants being East Asian ethnicity. As such, the clinical characteristics observed may not fully reflect those of TD patients from diverse ethnic backgrounds across different regions.Fourthly, Given that this paper presents a cross-sectional analysis, there is an absence of long-term follow-up studies regarding the conditions experienced by patients.

Conclusion

With the growing focus on the physical and mental health development of Chinese children, the age at which patients with TD are diagnosed has advanced. Furthermore, psychological factors tend to manifest before the onset of tic symptoms. Among patients seeking treatment, those with TS who exhibit more severe symptoms are the most common, often experiencing ADHD and displaying a higher susceptibility to oppositional defiant disorder, despite the relatively low incidence of OCB/OCD. Children with vocal tics face a higher risk of developing comorbid conditions. A harmonious family relationship positively influences the reduction of comorbidities in children with TD.

Abbreviations

ADHD	Attention-Deficit Hyperactivity Disorder
ANOVA	Analysis Of Variance
BD	Bipolar Disorders
CTD	Chronic Motor or Vocal Tic Disorders
DSM-5	Diagnostic and Statistical Manual of Mental Disorders Version 5
MINI-KID 5.0	Mini International Neuropsychiatric Interview for Children and Adolescents 5.0
OCB/OCD	Obsessive-Compulsive Behavior/Disorder
PTD	Provisional Tic Disorders
TD	Tic Disorders
TS	Tourette Syndrome
YGTSS	Yale Global Tic Severity Scale

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12887-024-05306-9.

Supplementary Material 1: Case report form.

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Author contributions

Project administration, methodology, funding acquisition, writing–review and editing were performed by XX. Supervision was performed by XX and HC. Data curation was performed by HC and XX. Formal analysis and visualization were performed by HC and FY. Investigation and resources were performed by XX, HC, SL, YC, FY and JC.Writing–original draft preparation was performed by HC. All authors read and approved the final manuscript.

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Data availability

The datasets generated and analyzed during the current study are not publicly available due to privacy or ethical restrictions, but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki and its later amendments. Approval was granted by the Ethics Committee of China-Japan Friendship Hospital(approval no. 2022-KY-045). Written informed consents were obtained from all study participants' parents or other legal guardians.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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