

Sociodemographic/Clinical Characteristics and Risk Factors Associated with Chronic Tic Disorders



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SUMMARY

Objective: This study aimed to investigate comorbidity, and sociodemographic and clinical characteristics in children and adolescents with Tourette's syndrome (TS) and chronic motor or vocal tic disorder (CMVTD), and to determine the predictors of tic disorders.

Materials and Methods: In all, 57 children and adolescents with TS and CMVTD were compared with a control group. Data were obtained using the Yale Global Tic Severity Scale (YGTSS), Turgay DSM-IV-Based Disruptive Behavioral Disorders Screening and Rating Scale (T-DSM-IV-S), Children's Depression Inventory (CDI), Screen for Child Anxiety-Related Disorders (SCARED), Maudsley Obsessive-Compulsive Inventory (MOCI), and Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version (K-SADS-PL).

Results: Mean age of the patients was 10.5 ± 2.4 years. In all, 56 (98.2%) of the patients had simple motor tics, 50 (87.7%) had complex motor tics, and 43 (75.4%) had vocal tics. Self-injurious behavior was observed in 24 (42.1%) patients. In total, 46 (80.7%) of the patients had ≥ 1 comorbid disorder. Among the observed comorbid disorders, attention deficit-hyperactivity disorder (ADHD) was the most common (observed in 40.4% of the patients), followed by obsessive-compulsive disorder (OCD) (19.3%). A higher-level of maternal education and absence of ADHD were associated with a reduction in the risk of a tic disorder. A family history of psychiatric disorder increased the risk of a tic disorder 5.61-fold, and nail biting increased the risk of a tic disorder 8.2-fold. Every 1-unit increase in CDI score increased the risk of a tic disorder by 12%.

Conclusion: Chronic tic disorders (CTDs) are often accompanied by other psychiatric disorders. Both child- and family-related factors are associated with the risk of developing a tic disorder. Determination of both the protective and risk factors would be beneficial for improving the mental health of the general public.

Keywords: Tic disorders, Tourette's syndrome, nail biting (onychophagia), child behavior, adolescents

INTRODUCTION

DSM-IV defines tics as involuntary, sudden repetitive movements or sounds that resemble aspects of normal behavior (APA 2000). Tourette's syndrome (TS) is a neuropsychiatric disorder in which motor and sound tics persist for ≥ 1 year. TS impairs psychosocial functioning (Eddy et al. 2011) and is associated with a high rate of comorbidity (Rickards 2011; Simpson et al. 2011). Studies suggest that TS and chronic motor or vocal tic disorder (CMVTD) are related. TS could be a more severe form of CMVTD (Spencer et al. 1995), and the 2

disorders might be associated with expression of the same gene (Conelea 2011). Although it was once known as a rare disorder, the prevalence of TS in children in Europe and Asia is currently 0.05%-3% (Roessner et al. 2011; Robertson et al. 2009).

Chronic tic disorders (CTDs) are often accompanied by other neuropsychiatric symptoms (Scharf et al. 2012). Obsessive-compulsive disorder (OCD), attention deficit-hyperactivity disorder (ADHD), intermittent outbursts of anger, self-harm, oppositional defiant disorder (ODD), somatic complaints, sleep disorders, and academic difficulty

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associated with ADHD or medication use are common in patients with tic disorders (Cleve Galvez-Jimenez 2012). TS and CMVTD can cause significant physical and psychological morbidity, even resulting in life-long disability in severe cases (Bloch et al. 2006; Khalifa and von Knorring 2006; Leckman et al. 1998).

The diagnosis of comorbid conditions accompanying tic disorders and the initiation of treatment at an early stage are particularly important for children and adolescents. As such, the present study aimed to investigate comorbidity, different forms of tics, and sociodemographic and clinical characteristics in children and adolescents with a CTD, to compare these findings with those of a control group, and to identify the predictors of tic disorders.

MATERIALS and METHODS

Participant Selection

The study protocol was approved by the Karadeniz Technical University (KTU), School of Medicine Ethics Committee. Of the 62 consecutive children and adolescents aged 6-16 years that presented to our child-adolescent mental health outpatient clinics within a period of one year, and were diagnosed with CMVTD or TS, 57 that agreed to participate and didn't meet any of the exclusion criteria were included in the study. The control group comprised 57 age- and gender-matched children and adolescents without any other physical or chronic mental diseases that presented to the hospital for various reasons (eye exam, upper respiratory tract infection, psychological counseling, or vaccine side effects). Children and adolescents presented to various pediatric units, especially the unit for the healthy children, met the inclusion criteria, were informed about the study, and those that agreed to participate were included in the study.

Exclusion criteria for both patients and controls were mental ability insufficient for completing the questionnaires, presence of another accompanying serious medical disorder, or having uneducated parents. Of the 62 consecutive children and adolescent patients, 5 were excluded: 3 due to mental retardation, 1 due to type I diabetes mellitus, and 1 due to lack of time of parents to complete the questionnaires.

Data collection tools

Semi-Structured Interview Form

This form was designed to collect sociodemographic data, and record the participants' developmental story and family history (parents and siblings). We were particularly interested in noting the occurrence of nail biting.

Yale Global Tic Severity Scale (YGTSS)

YGTSS is an 11-item clinician-rated instrument that measures the severity of motor and vocal tics (Leckman et al.

1989). The severity of motor and vocal tics are evaluated in 5 domains (number, frequency, intensity, complexity, and blocking). The 5 index scores are the total motor tic score, the total phonic tic score, the total tic score, the total disruption rating, and the global severity score. Zaimoğlu et al. (1995) reported that the Turkish version of the scale was valid and reliable for use in the Turkish population.

Turgay DSM-IV-Based Disruptive Behavioral Disorders Screening and Rating Scale (T-DSM-IV-S)

This scale was developed by Turgay (1995) to screen for disruptive behavior disorders and is based on DSM-IV diagnostic criteria (Turgay 1995). Ercan et al. (2001) reported that the Turkish version of the scale was valid and reliable for use in the Turkish population. The scale is completed by a child's parents and teachers.

Children's Depression Inventory (CDI)

CDI is a self-report questionnaire used to evaluate depression in children aged 6-17 years. Öy reported that the Turkish version of the scale was valid and reliable for use in the Turkish population (Öy 1991; Kovasc 1985).

Screen for Child Anxiety-Related Emotional Disorders (SCARED)

The original scale was developed by Birmaher et al. (1997) and Çakmakçı (2004) reported that the Turkish version of the scale was valid and reliable for use in the Turkish population. Children are asked to mark the most appropriate response to each item.

Maudsley Obsessive-Compulsive Disorder Inventory (MOCI)

The MOCI is a self-report questionnaire used to measure the type and extent of obsessive-compulsive symptoms in healthy individuals and psychiatric patients. The original scale consisted of control, cleaning, slowness, and suspicion subscales (Hodgson and Rachman 1977), whereas, a rumination subscale is included in the Turkish version (Erol and Savaşır 1988). Analysis of the Turkish version's validity and reliability has not yielded a cut-off score.

Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL)

This scale was developed by Kaufman et al. (1997) and Gökler et al. (2004) reported that the Turkish version of the scale was valid and reliable for use in the Turkish population. Mood disorders, psychotic disorders, anxiety disorders, elimination disorders, disruptive behavior disorders, substance abuse disorders, eating disorders, and tic disorders can be evaluated using the K-SADS-PL. Past diagnoses, except for bipolar affective disorder and psychotic disorders, were not included within the scope of the present study.

Process

In order to collect data the children and their parents that agreed to participate in the study were interviewed at least twice. K-SADS-PL was administered to the control group to determine the presence or absence of psychiatric illness. Asperger's syndrome was diagnosed according to DSM-IV.

Statistical evaluation

IBM SPSS v.20.0 for Windows was used for all statistical analyses. Quantitative variables are given as mean $\bar{X}$ and the standard deviation (SD), and categorical variables are given as percentages (%). The level of statistical significance was set at $P = 0.05$. The Kolmogorov-Smirnov test was used to determine the normality of data distribution. In cases in which the sample size was ≤ 30 in 1 of the groups being compared the Mann-Whitney U test was used for comparisons; in all other cases comparison of mean differences in scores was made using Student's t-test for quantitative variables with normal distribution, and the Mann-Whitney U test for those not normally distributed. Differences in the frequency of categorical data between groups, such as gender or parental level of education, were investigated using the chi-square test. Risk factors associated with CTDs was evaluated using multinomial logistic regression analysis.

RESULTS

The patient group included 42 patients with TS and 15 with CMVTD; 43 (75.4%) of the patients were male. Mean age in the patient group was 10.5 ± 2.4 years, versus 10.3 ± 2.4 years in the control group. There was a significant difference between the 2 groups in terms of having attended pre-school ($P = 0.022$, Table 1). The 2 groups were compared with regard to parental employment and substance use (alcohol and smoking). The fathers of all of the children in both groups were

Table 1. Comparison of some sociodemographic data based on the chi-square test

		Patients (n = 57)		Controls (n = 57)		X ²	P
		n	%	n	%		
Gender	Female	14	24.6	14	24.6	0	1.000
	Male	43	75.4	43	75.4		
Distribution of Age Groups	6-8 years	11	12.3	13	12.3	0.407	0.816
	9-11 years	24	49.1	25	54.4		
	12-16 years	22	38.6	19	33.3		
Preschool Education	Yes	35	61.4	47	82.5	5.257	0.022*+
	No	22	38.6	10	17.5		
Employment Status of Mother	Unemployed	47	82.5	38	66.7	2.96	0.085+
	Employed	10	17.5	19	33.3		
Substance Abuse in Mother	Absent	48	84.2	53	93.0	1.389	0.239+
	Present	9	15.8	4	7.0		
Substance Abuse in Father	Absent	33	57.9	45	78.9	4.912	0.027*+
	Present	24	42.1	12	21.1		

X²: Chi-square value.

+Continuity-corrected chi-square test was applied.

* $P < 0.05$

employed, but there was a significant difference in paternal substance use between the two groups ($P = 0.027$, Table 1).

There was a significant difference between the 2 groups in terms of the mean parental level of education in years ($P < 0.0001$ for both mothers and fathers) (Table 2). The patient group had a higher mean number of siblings ($P = 0.040$), whereas there wasn't a significant difference the 2 groups in terms of the mean number of family members ($P = 0.236$, Table 2). Among the patients, 5 (8.8%) were twins; 3 of these patients' twin sibling exhibited no signs of a tic disorder, whereas the other 2 patients were twin siblings.

When monthly family income was grouped as 0-1000 TL, 1001-2000 TL, and ≥ 2001 TL there was a significant difference between the 2 groups ($X^2 = 9.371$, $P = 0.009$). Nail

Table 2. Statistical comparison of some sociodemographic variables.

Variable	Patients (n = 57)	Controls (n = 57)	(U, Z) or t+	P
Age	10.5 ± 2.4	10.3 ± 2.5	(1521.5, -0.590)	0.555
Education (in years)	4.8 ± 2.5	4.7 ± 2.2	(1603.0, -0.123)	0.902
Mother's Age (years)	38.1 ± 5.7	38.9 ± 5.2	-0.794	0.429
Mother's Education (in years)	7.6 ± 3.6	11.2 ± 3.9	(846.0, -4.613)	<0.0001*
Father's Age (years)	42.6 ± 7.5	42.7 ± 6.1	-0.069	0.945
Father's Education (in years)	9.5 ± 4.2	12.7 ± 3.6	(947.0, -3.998)	<0.0001*
Number of Siblings	2.7 ± 0.9	2.3 ± 0.8	(1292.0, -2.053)	0.040*
Number of Family Members	4.7 ± 1.4	4.4 ± 0.8	(1429.0, -1.184)	0.236

+Mann-Whitney U test U and Z values, and t-test t values are shown in the table.

* $P < 0.05$

Table 3. Distribution of neuropsychiatric diseases in the participants' family members.

Psychiatric Disease in a Family Member	Patients (n = 57)		Controls (n = 57)	
	n	%	n	%
None	26	45.6	48	84.2
ADHD in a Sibling	2	3.5	2	3.5
Depression in Mother	12	21.1	5	8.8
Depression in Father	5	8.8	0	0.0
Tic Disorder in Father	5	8.8	2	3.5
Alcohol Abuse in Father	2	3.5	0	0.0
Epilepsy in Father	1	1.8	0	0.0
Tic Disorder in Uncle	2	3.5	0	0.0
Anxiety Disorder in Mother	1	1.8	0	0.0
Epilepsy in Mother	1	1.8	0	0.0
OCD in Mother	1	1.8	0	0.0
Tic Disorder in a Sibling	6	10.5	0	0.0
Chronic Tic Disorder in a Family Member	10	17.5	0	0.0

biting was noted in 33 patients (57.9%), versus in 7 (12.3%) controls ($X^2 = 26.035$, $P < 0.0001$). A family history of any psychiatric disease was recorded in both groups. The distribution of psychiatric diseases according to parental reports is shown in Table 3. In the patient group 10 (17.5%) patients had a family history of CTD.

Clinical findings and the distribution of tics in the patients with a CTD

Among the patients with a CTD, 42 (73.7%) had TS and 15 (26.3%) had other types of CTD. Only 1 patient (1.8%) with a non-Tourette's CTD had a chronic vocal tic disorder, whereas the others had chronic motor tic disorder. During the interview process all patients and their parents were asked about the presence of simple motor tics, complex motor tics, vocal tics, and complex vocal tics. Simple motor tics were noted in 56 patients (98.2%), complex motor tics in 50 (87.7%), and phonic tics in 43 (75.4%) (Table 4).

Self-injurious behavior was noted in the form of peeling the skin around finger nails until bleeding, scraping wounds, lip peeling, scalp scraping and hair pulling, head banging, and biting the skin on the palms corresponding to the joints. Simple phonic tics in the patients with a tic disorder included throat clearing (45.6%), coughing (33.3%), sniffing (31.6%), breathing sounds (3.5%), whistling (3.5%), and swallowing (3.5%). Complex phonic tics consisted of clicking the tongue, cackling like a chicken, mimicking the sound of construction machinery, and such repeated sounds as ha-ha-ha or aw-aw-aw (26.3%). Coprolalia was noted in 14.0% of the patients, palilalia in 12.3%, blocked speech in 12.3%, and echolalia in 8.8%. In all, 10 females (17.5%) and 32 males (56.1%) fulfilled the diagnostic criteria for TS.

Table 4. Distribution of simple and complex tics in the patient group.

Simple Motor Tics	n	%
Eye Movements	48	84.2
Head Movements	42	73.7
Mouth Movements	37	64.9
Hand Movements	34	59.6
Nose Movements	33	57.9
Leg and Foot Movements	28	49.1
Shoulder Shaking	24	42.1
Grimacing	19	33.3
Arm Movements	17	29.8
Contracting Abdominal Muscles	12	21.0
Complex Motor Tics	n	%
Self-Destructive Behavior	24	42.1
Eye Movements	23	40.3
Mouth Movements	19	33.3
Head Movements	19	33.3
Hand Movements	19	33.3
Face Movements	17	29.8
Leg and Foot Movements	16	28.0
Touching	16	28.0
Shoulder Movements	12	21.1
Dystonic Position	11	19.3
Flexion-Conversion	11	19.3
Copropaxia	11	19.3
Arm Movements	10	17.5
Writing Tics	8	14.0
Blocks	8	14.0
Sniffing	5	8.8
Spitting	1	1.8

Comorbidity in the patients with a tic disorder

In total, 11 (19.3%) of the patients did not have a comorbid condition, whereas 46 (80.7%) had ≥ 1 comorbid disorders. The most frequently noted comorbidity was ADHD (40.4%), followed by OCD (19.3%) (Table 5). Among the patients, 32.5% of the nail biters and 14.9% of the non-nail biters had ADHD. The independence of these 2 variables was rejected by the continuity-corrected chi-square test ($X^2 = 3.855$, $P = 0.0495$). The mean age of tic onset was 3.2 ± 1.7 years.

Assessment of depression, anxiety, and OCD symptom scores

Mean CDI and MOCI scores were significantly higher in the patient group ($P < 0.0001$ and $P = 0.001$, respectively), whereas there wasn't a significant difference in SCARED scores between the patient and control groups ($P = 0.995$). Within both groups, there wasn't a significant difference in CDI, SCARED, or MOCI scores between those aged ≥ 12

Table 5. Distribution of comorbid disorders accompanying tics disorders.

Comorbidity	n	%
None	11	19.3
ADHD	23	40.4
OCD	11	19.3
ODD	10	17.5
Enuresis	9	15.8
Depressive Disorder	8	14.0
Generalized Anxiety Disorder	6	10.5
Anxiety Disorder, NOS	5	8.7
Encopresis	3	5.2
Conduct Disorder	3	5.2
Social Phobia	2	3.6
Specific Phobia	1	1.8
PTSD	1	1.8
Asperger Syndrome	1	1.8

NOS: Not otherwise specified; PTSD: post traumatic stress disorder.

years and those aged ≤ 12 years. Within both groups, there wasn't a significant difference in CDI, SCARED, or MOCI scores based on gender (Table 6). In the patient group, mean onset of tics was 2.7 ± 1.3 years in females and 3.4 ± 1.8 years in males; the difference was not significant ($P = 0.197$).

Protective and risk factors in the patients with a CTD

Multinomial logistic regression analysis was performed to determine the predictors of tic disorders. Multinomial logistic regression was used instead of a binary logistic regression due to numerical errors in SPSS when the latter was applied, because all the participants with ADHD were in the patient group, and as such during the analysis some of the cells were empty. In order to avoid numerical errors using multinomial regression, 0.02 was used as the delta value, which is among

Table 6. Comparison of CDI, SCARED, and MOCI scores between the patient and control groups, between female and male patients, and between the patients aged ≥ 12 years and ≤ 11 years.

	CDI	SCARED	MOCI
Patients (n = 57)	11.7 $\pm$ 6.4	25.0 $\pm$ 9.1	18.5 $\pm$ 7.4
Controls (n = 57)	6.8 $\pm$ 4.1	24.6 $\pm$ 10.7	14.1 $\pm$ 5.5
(U, Z) or t	4.824	(1623.5, 0.995)	3.536
P	<0.0001*	0.995	<0.001*
Female (n = 14)	11.2 $\pm$ 6.9	26.8 $\pm$ 9.6	17.5 $\pm$ 7.9
Male (n = 43)	11.8 $\pm$ 6.3	24.3 $\pm$ 8.9	18.8 $\pm$ 7.2
(U, Z)	(281.5; -0.362)	(260.0, -0.762)	(254.5; -0.748)
P	0.717	0.446	0.454
6-11 years (n = 35)	11.4 $\pm$ 6.3	25.7 $\pm$ 9.4	18.7 $\pm$ 7.5
(U, Z)	(355.0; -0.493)	(355.5, -0.485)	(334.5; -0.559)
12-16 years (n = 22)	12.0 $\pm$ 6.7	23.8 $\pm$ 8.6	18.0 $\pm$ 7.3
P	0.622	0.628	0.576

Either the Mann-Whitney U test or the t test was used for comparisons.

* $P < 0.05$

the convergence parameters for the multinomial regression in SPSS, and in the cross-tables this value was assigned to each empty cell. This option is not available for binary regression in SPSS. The analysis included the participants' age, school grade, gender, presence or absence of nail biting, level of education of both parents in years, presence or absence of a family history of psychiatric disorder, CDI and MOCI scores, and the presence or absence of ADHD. Based on this analysis, the predictors associated with tic disorders were identified. A causal relationship cannot be established via logistic regression analysis. In the present study with the word risk, no cause and effect relationship is expressed, rather, the likelihood of the presence of tics together with statistically significant variables/variable values is meant.

Each 1-unit increase in the number of years of maternal education decreased the risk of a tic disorder by 20%. Every 1-unit increase in CDI score increased the risk of a tic disorder by 12%. A family history of psychiatric disease increased the risk of a tic disorder 5.61-fold. The presence of nail biting increased the risk of a tic disorder 8.16-fold. The predictive variable with the highest OR for a tic disorder was the presence of ADHD (Table 7). Due to the study's small sample, the OR values obtained should not be considered absolute values, but rather approximate values that could be used to inform additional research.

Table 7. Preventive and risk factors for CTDs.

	B	OR	95% CI	P
Mother's level of education (in years)	-0.219	0.803	0.659-0.979	0.030*
Father's level of education (in years)	0.060	1.062	0.895-1.260	0.494
Age (years)	0.238	1.269	0.522-3.083	0.599
Class	-0.340	0.712	0.275-1.846	0.485
Gender				
Female	0.121	1.129	0.329-3.875	0.847
Male	0			
ADHD				
Absent	0			
Present	3.282	26.627	3.541-200.250	0.001*
MOCI	0.036	1.037	0.940-1.145	0.469
Psychiatric Disorder in a Family Member				
Absent	0			
Present	1.725	5.612	1.491-21.124	0.011*
Nail Biting				
Absent	0			
Present	2.100	8.165	2.315-28.792	0.001*
CDI	0.114	1.121	1.000-1.257	0.0495*

Multivariate logistic regression analysis was performed.

CDI: Child depression Inventory

MOCI: Maudsley Obsessive Compulsive Inventory

* $P < 0.05$

DISCUSSION

In the present study's patient group the male/female ratio was approximately 3:1; other studies have reported percentages of 65%-82% (Semerci, 2007; Toros et al. 2002; Moriarty et al. 1995; George et al. 1993; Robertson et al. 1993). Mean age at onset of tics in the present study was 3.2 years and the patients were evaluated for the study upon their initial presentation to our outpatient clinics. It is possible that the parents did not recognize the symptoms, were in denial concerning the problem if they did recognize the symptoms, or expected that their child would recover spontaneously, thus delaying presentation for medical care. Mean age at initial presentation was lower among the female patients, perhaps because the parents were more tolerant of their sons' behavioral problems.

There was a significant difference in the level of parental education between the 2 groups. In the patient group the mean duration of maternal education was 7.6 ± 3.6 years (primary level), versus 11.2 ± 3.9 years (high school level) in the control group. Toros et al. evaluated the level of education in the parents of tic disorder patients and reported that about 40% had a high school or above level of education (Toros et al. 2002); however, they did not differentiate between maternal and paternal levels of education. In the present study mean duration of paternal education in the patient group was 9.5 ± 4.2 years (primary-high school level), versus 12.7 ± 3.5 years in the control group. The reason for this difference may be the small sample size of the previous study. In a community-based study in Sweden Khalifa and von Knorring failed to find a significant difference in the level of parental education between the control group, and the CMVTD, TS, and transient tics groups (Khalifa and von Knorring 2005). This difference in findings may be due to the fact that Sweden's level of education among the general public is higher than that of Turkey's. In a community-based study by Chartier et al. that examined the effect of childhood experiences on adult mental health, low-level parental education was considered as risk factor (Chartier et al. 2010). In the present study maternal level of education was associated with the development of a tic disorder based on logistic regression analysis. The inconsistency of findings across studies and geographic regions highlights the need for additional multinational studies with larger samples.

There was a significant difference in pre-school education between the 2 groups in the present study; fewer of those in the patient group had any pre-school education. In a 25-year follow-up study conducted by Barnett et al. pre-school education was shown to provide economic benefits to individuals and to society in the future (Barnett 1993). In another 15-year follow-up study to age 20 years, pre-school education was reported to be associated with positive social outcomes and a better level of education (Reynolds et al. 2001). Socialization that occurs at

nursery school and pre-school education programs accelerates the development of a child's knowledge and skills.

In the present study those in the patient group had significantly more siblings than those in the control group. As the number of siblings in a family increases, the time that parents can spend with each child decreases. Especially in the presence of additional factors that affect the parents, the poor parent-child relationship is considered as a factor affecting the mental health of child later in life (Chartier et al. 2010). To the best of our knowledge the literature is devoid of any studies on the effect of the number of siblings on the development of tic disorders; however, Flouris et al. suggested that a large number of familial risk factors are direct or independent predictors of a child's psychopathology (Flouris et al. 2010). As such, it is not surprising that the present study's patient group had more siblings. There was a significant difference in monthly family income between the present study's 2 groups. Ongoing poverty causes the symptoms of introversion, whereas current poverty leads to extroversion (McLeod and Shanahan 1993). Khalifa and Knorring (2005) reported that there wasn't a difference between the tic disorder group and the control group in terms of socioeconomic status and parental level of education. The difference in such variables as the number of siblings, pre-school education, and monthly family income between the 2 groups suggest that, in addition to genetics, environmental factors may also have an effect on the etiology of CMVTD and TS.

There was a significant difference with regard to nail biting between the present study's 2 groups. Nail biters had an 8.1-fold higher risk of a tic disorder. Nail biting can be a sign of anxiety and may be a behavior that relieves anxiety (Wells et al. 1998; Leonard et al. 1991). In the present study the presence of ADHD and nail biting were strongly associated. Simple forms of nail biting can be present in the absence of an accompanying psychiatric disorder (Ghanizadeh and Mosallaei 2009). With the exception of a study by Ghanizadeh and Mosallaei (2009) on psychiatric disorders and behavioral problems in children and adolescents with TS, and a study on psychiatric disorders in children with nail biting (Ghanizadeh 2008), to the best of our knowledge there are no studies in the literature on the relationship between tic disorders and nail biting. Ghanizadeh and Mosallaei (2009) noted nail biting in 28.6% of the tic disorders group. In the present study, nail biting was noted in 57.9% of the patient group. A higher rate of nail biting in the patient group confirms the fact that nail biting is observed more frequently in psychiatric disorders. Furthermore, the relationship between ADHD and nail biting is also noteworthy.

There was a significant difference between the present study's 2 groups in terms of paternal substance use. In a longitudinal follow-up study of children of alcoholic parents in the general population, it was reported that the children of alcoholic

parents had a higher pre/postnatal risk of mortality than other children, had poorer mental development, and had a higher risk of exhibiting symptoms of psychopathology (Nordberg 1993). The inability of parents with alcohol or other substance abuse to be a positive role model for their children, and the negative attitudes and events that their children are exposed to at home may be among the factors increasing the risk of psychopathology.

In the present study 10 (17.5%) of the patients had a family history of CTD, which might indicate that genetic transmission is an etiological factor. Eapen et al. (1993) reported that in the families of TS patients the rate of TS was 35.2%, and the rate of chronic motor tic disorder was 24.7%. According to Toros et al., 1 parent of 14.2% of the individuals with TS had a mental disorder. They suggested that the low rate of diagnosed mental illness in the families was due to false negative results based data obtained via anamnesis (Toros et al. 2002). In the present study a family history of psychiatric disease was associated with a 5.612-fold increase in the risk of a tic disorder.

In the present study simple motor tics were observed in 56 patients (98.2%), complex motor tics in 50 (87.7%), and phonic tics in 43 (75.4%). An earlier study conducted with 44 adult patients with a tic disorder (TS: $n = 33$; chronic motor or vocal tic disorder: $n = 10$; transient tic disorder: $n = 1$) reported simple motor tics in 97.7% of the patients, complex motor tics in 15.9%, and simple vocal tics in 75% (Teive et al. 2001). The difference between that study's findings and those of the present study is probably due to the fact that the present study included patients aged 6-16 years, a period characterized by exacerbation of the disease. The severity of tics usually peaks during the start of the second decade of life, and in most patients there is a significant reduction in tic severity in late adolescence (Bloch 2006). Another reason for the difference between the studies' findings may be the high percentage of patients in the present study with TS, which is considered the most severe form of tic disorder.

Coprolalia was observed in 8 patients (14.0%) in the present study. The incidence of coprolalia, considered to be among the best-known symptoms of TS, is reported to be 5%-30% (Teive et al. 2001), which is similar to that noted in the present study. In the present study 11 patients (19.3%) had copropraxia, which is noteworthy, as Teive et al. reported a rate of 4.5% (Teive et al. 2001); the difference in rates may have been due the nature of the present study's population.

The present study's patient group significantly differed from the control group in terms of depression and the severity of the symptoms of OCD. Each 1-unit increase in CDI score was associated with a 12% increase in the risk of developing a tic disorder. It was reported that the level of psychosocial

stress and depression are predictors of the future severity of tics (Lin et al. 2007).

Among the comorbid disorders in the present study, ADHD was the most common (40.4%), followed by OCD (19.3%). The TS and ADHD comorbidity rate was reported to be 78.7% (Comings et al. 1990), 27% (Leckman and Cohen 1994), 90% (Spencer et al. 1995), and 39.7% (Mathews et al. 2004). TS usually has a complex relationship with ADHD and other disorders. Among the predictors of the presence of a tic disorder that were examined in the present study, the variable with the highest OR was ADHD. Although causality could not be established, the risk of co-presence of these conditions is very high. It is important not to overlook the diagnosis of ADHD while assessing the behavioral problems frequently associated with TS. Perhaps, ADHD should be evaluated and treated within the diagnosis of TS.

Comorbidity of tic disorders and OCD was first reported long ago (Levin et al. 2010). It has been reported that there is a mutual relationship between the 2 entities: 20%-60% of individuals with a tic disorder fit the OCD criteria, whereas 20%-38% of children with OCD meet the criteria for a tic disorder (Ivarsson et al. 2008; Eichstedt and Arnold 2001). Some researchers have suggested that the symptoms of OCD are the same symptoms observed in some patients with TS, and that it would be more appropriate to approach OCD as a variation of TS (Fibbe et al. 2011; Paul et al. 1986). In the present study 19.3% of the patients had OCD. As the duration of TS increases, the incidence of the symptoms of OCD increases. OCD has been reported to be more pronounced and severe in older TS patients (Robertson 1989). In the present study the low OCD occurrence rate was likely due to the low mean age of the patients (10.5 ± 2.4 years). It is possible that the symptoms of OCD will increase in number and/or severity as the TS patients age. A study that included 101 children diagnosed with TS reported that although there were no symptoms of OCD initially, 8% of the patients developed such symptoms later (Steingard and Dilion 1992). The researchers reported that ADHD occurred more frequently than OCD, probably due to the fact that the period of early development was mainly investigated. In the present study the third most frequent comorbidity in the patient group was ODD (17.5%), which might have been associated with the prevalence of ADHD.

In conclusion, CMVTD and TS are serious disorders that negatively affect many domains of an individual's life. Attention deficit, hyperactivity-impulsivity, and obsessive-compulsive behaviors often accompany tics, and should be evaluated. In addition, patients with tic disorders frequently exhibit nail biting. As depressive symptoms increase, the risk of a tic disorder also increases. A holistic approach, in which all such symptoms are considered as a part of tic disorders, can be beneficial.

Limitations

All scales used in this study were considered to be valid and reliable for their intended purposes. The results of this study are limited to the findings obtained in the participants and cannot be generalized. Furthermore, assessment of psychiatric disorders in the participants' parents based on anamnesis only is a limitation of the study. Another limitation of the study is the small sample that was included. In particular, logistic regression analysis provides more powerful results in larger samples.

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