

# Prevalence and Comorbidity of Tic Disorder in Israeli Adolescents: Results from a National Mental Health Survey

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**ABSTRACT:** **Background:** Tic disorders are common causes of morbidity in Israel but their prevalence in this country needs further study.

**Objectives:** To assess the prevalence of mental disorders in Israeli youth including tic disorders, as part of the Israel Survey of Mental Health among Adolescents (ISMEHA).

**Methods:** The ISMEHA was conducted in a representative sample of 957 adolescents aged 14–17 and their mothers during 2004–2005. We interviewed the adolescents and their mothers in their homes and collected demographic information about the use of services. We also administered a psychiatric interview, the Development and Well-Being Assessment inventory (DAWBA), which included a question on tic disorder. The prevalence of tic disorders was calculated based on the adolescents' and maternal reports. The relationships among demographic data, comorbidity rates, help-seeking behaviors and tic disorder are presented.

**Results:** The prevalence of tics was 1.3% according to maternal reports and 4.4% according to adolescents' reports. The prevalence correlated with externalizing disorders and learning disabilities. A higher prevalence of tics was found in the Arab population compared with Jewish adolescents.

**Conclusions:** The prevalence of tic disorders in Israel, as measured by a direct question in this epidemiological study, and associated comorbidities concurs with previous reports. The complexities of prevalence estimations, comorbidities, demographic correlates, and help-seeking behaviors are discussed.

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**KEY WORDS:** prevalence, tic disorders, Tourette syndrome, epidemiology, adolescents

prevalence rate of 0.3%. In their review (covering ages 5–18 years), Robertson [1] found prevalence rates ranging from 0.4% to 3.8%. Recalculation after the databases were pooled yielded an overall prevalence rate of 1%.

The different types of tic disorders may have different prevalence rates. In the same review Robertson [1] noted that motor tics were much more common than Tourette syndrome, with a point prevalence of 1–29% in the different studies. More recently, Olfson et al. [4] conducted a 1 year study of public and private insurance claims for tic disorder among subjects aged 4–18 years and reported diagnosis rates of 0.50–0.53/1000 for Tourette syndrome, 0.08–0.10/1000 for chronic motor or vocal tic disorder, and 0.43–0.59/1000 for other tic disorders. In the United Kingdom, the reported prevalence of all tic disorders was 4% in a community-based study [5] and 3% in a survey of middle-school youth [6].

Tourette syndrome has been reported worldwide, occurring in all sociocultural, socioeconomic, religious, linguistic and ethnic groups [7]. However, its clinical characteristics and associated features are better known in western than non-western cultures [8]. The prevalence may be slightly lower in China [2]. In the USA, African-American and Hispanic children and adolescents were found to have lower rates of tic disorder than white youth [4]. Genetic and epigenetic factors may also play a role in the etiology of the disorder, affecting prevalence rates and phenotypic expression across races [2].

Tourette syndrome was found to be associated with comorbidities in 88% of clinical samples of patients of all ages, especially among males [9]. The most common comorbidities were attention deficit/hyperactivity disorder (60%) and obsessive-compulsive disorder/syndrome (59%). Olfson and colleagues [4] found higher rates of comorbidities among publicly insured than privately insured youth. The comorbidities included ADHD (50.2% vs. 25.9%), other disruptive behaviors (20.6% vs. 5.6%), and depression (14.6% vs. 9.8%). Publicly insured youth also had higher rates of antipsychotic medication use (53.6% vs. 33.2%). The diagnosis of Tourette syndrome was four to five times higher in youth who had

ADHD = attention deficit/hyperactivity disorder

The reported prevalence of tic disorders depends, at least partly, on the specific definition used, manner of ascertainment, and epidemiological methods employed [1,2]. A recent study of Tourette syndrome conducted by the United States Centers for Disease Control and Prevention [3] reported a

been diagnosed with ADHD compared with those who had not. Kurlan and colleagues [10] noted a 4% rate of Tourette in regular classrooms compared to up to 7% in special education classes.

The aim of the present study was to determine the prevalence of tic disorder in a nationwide sample of 13–15 year old subjects in Israel and to evaluate its associated comorbidities and the effect of sociodemographic factors. We assumed that a community study would eliminate any referral biases [11]. The age span of the population was restricted in order to control for developmental differences.

## PATIENTS AND METHODS

This study is part of the cross-sectional Israel Survey of Mental Health among Adolescents (ISMEHA) administered by the Mental Health Services of the Israel Ministries of Health and Education and Schneider Children's Medical Center of Israel in 2004 and 2005. A detailed description of the sample, data collection, procedures, and instruments has been published previously [12]; a summary will be presented here.

### SAMPLE AND PROCEDURES

The sample included 954 adolescent-mother dyads; 4.9% of the adolescents aged 14–17 ( $n=50$ ) and 1.7% of the mothers ( $n=22$ ) did not answer the questionnaire although the other person in the dyad did. The sampling frame used was the National Population Register, which included the names of all legal residents of Israel born between 2 July 1987 and 30 June 1990 ( $n=317,604$ ). Due to budgetary constraints, only settlements with more than 2000 inhabitants were included and they comprise 90% of the target population. One child from each family was included in the sample. There were no replacements. Mothers and adolescents were interviewed separately at home by two trained lay interviewers in Hebrew, Arabic or Russian. Parents provided written informed consent for their own and their child's participation in the study.

### INFLATION METHOD AND RESPONSE RATES

Of the total sample ( $n=1402$ ), 15% ( $n=207$ ) could not be located and 17% ( $n=238$ ) refused to participate. Thus the response rate was 80% in the located sample ( $n=1195$ ) and 68% ( $n=954$ ) in the total sample. Non-response was higher among Jews (24%,  $n=218$ ) than among Arabs (7%,  $n=20$ ); no differences by gender or immigrant status were noted. The sample was weighted back to the total population to compensate for unequal selection probabilities resulting from clustering effects and non-response. The weights were adjusted to make weighted sample totals conform to known population totals taken from reliable Central Bureau of Statistics sources, excluding Jewish ultra-Orthodox youth who were not included in the study.

### DATA COLLECTION

- *Sociodemographic data*: data were collected on the subject's age and gender, population group, paternal employment status, and welfare care status
- *Mental health assessment*: mental disorders were identified with the Development and Well-Being Assessment (DAWBA), a multi-informant structured interview with open-ended questions on psychiatric symptoms and their impact on quality of life and family. The presence of a tic disorder was addressed in the DAWBA by a yes/no question: "Does your son/daughter have tics or twitches that he/she can't seem to control?" (mother's interview); or "Do you have tics or twitches which you can't seem to control?" (adolescent's interview).
- *Help-seeking behaviors*: We asked both mothers and adolescents about the use of mental health services for the emotional and behavioral problems of the adolescent during the 12 months preceding the interview. Mothers were asked whether they consulted different professionals and other community sources about their child's behavioral or emotional problems. Adolescents were asked whether they had consulted someone in school in the past year for emotional or behavioral problems not related to school-learning material. Mothers were also asked whether their child had ever received medication for emotional/behavioral or hyperactivity problems or had ever taken methylphenidate (commonly known as Ritalin®).

### STATISTICAL ANALYSIS

Statistical analyses were conducted using an SPSS-17 complex sample analysis module (IBM-SPSS Inc, Chicago, IL). Prevalence rates for tic disorder according to the mothers' and adolescents' reports were analyzed by selected sociodemographic factors, comorbidities and help-seeking behaviors. The results are presented as percentages with standard errors. Raw numbers and weighted proportions are presented for the characteristics of the study population and for the univariate analyses. Because of the small number of cases of tic disorder, we used Mann-Whitney U statistics to analyze the association among tic disorder, sociodemographic factors, morbidity, and consultation by adolescents. Z values and significance were calculated.

## RESULTS

The characteristics of the adolescents included in the study are shown in Table 1.

### RESPONSE TO THE TIC DISORDER QUESTION

The item on tic disorder was answered by 902 adolescents (99.4%) and 729 mothers (77.7%). Analysis by population

DAWBA = Development and Well-Being Assessment

**Table 1.** Sociodemographic characteristics of the ISMEHA sample (raw numbers and weighted proportions)

	N	%
<b>Age (yr)*</b>		
14–15	285	33.5
16	447	33.3
17	225	33.2
<b>Gender*</b>		
Male	497	51.2
Female	460	48.8
<b>Population group*</b>		
Jewish	657	77.0
Muslim and Christian Arab or Druze	300	23.0
<b>Marital status of parents**</b>		
Married	813	85.6
Single/divorced/widowed	122	14.4
<b>Maternal years of schooling**</b>		
0–11	299	27.3
12	277	32.8
≥ 13	325	39.9
<b>Paternal employment status**</b>		
Employed	661	77.0
Unemployed	214	23.0

\*Data obtained from the National Population Register

\*\*Data obtained from the interviewees

group showed that 99.9% of the Jewish adolescents and 98.6% of the Arab/Druze adolescents answered the question. Corresponding rates for the mothers were 91% and 44% due to a technical glitch in the Arabic interview protocol for the mothers' version. Therefore, prevalence rates for tic disorders in this population will be presented for Jewish and Arab adolescents but only for Jewish mothers.

#### PREVALENCE OF TICS

Among the adolescents, 43/902 (4.4%) reported that they had a tic disorder, and among the mothers 8/598 (1.3%) reported a tic disorder in their child. Analyses of maternal and adolescents' responses by the various sociodemographic variables yielded no significant correlations of a positive response with adolescent age or gender, maternal marital status, maternal years of schooling, or paternal employment. The prevalence of tic disorder, as reported by adolescents, was significantly higher in the Arab than in the Jewish population group, but the comparison of Jewish and Arab mothers' reports regarding tic disorder in their children could not be made, as explained above [Table 2].

#### COMORBIDITY AND HELP SEEKING

When assessing comorbidity, we found that tic disorder, as reported by the adolescents, was associated with learning disabilities: among adolescents with a learning disability 7.5% reported a tic disorder compared to 3.4% among those without a learning disability. The associations between tic disorder and any mental disorder and with speech and hear-

**Table 2.** Prevalence of Tic disorder by population group (raw numbers and weighted percentages)

	Prevalence of Tic disorder		
	N	% (SE)	Mann-Whitney U
<b>Adolescents</b>			
Jews	18/610	3.1 (0.8)	Z = 0.698, P = 0.000
Arabs and Druze	25/292	8.7(3.8) 4.4 (1.1)	
Total	43/902		
<b>Mothers</b>			
Jews	8/598	1.3 (0.5)	–
Total	8/598	1.3 (0.5)	

ing impairments were of borderline statistical significance ( $P = 0.56$  for both). Adolescent-reported tic disorder was also associated with help-seeking practices: among adolescents who consulted someone in school 8.1% reported a tic disorder as compared to 3.4% who did not [Table 3].

Table 3 also shows that tic disorder, as reported by the mothers, was associated with externalizing disorders and with hearing or speech impairment: mothers reported that 7.2% of adolescents with an externalizing disorder had tic disorder as compared to 0.9% among those without an externalizing disorder. Among adolescents with hearing/speech impairment, 4.9% had a tic disorder as compared to 1% without hearing/speech impairment. Maternal reported tic disorder was also associated with adolescent help-seeking practices: among adolescents who consulted someone in school in the past year 3.1% had a tic disorder as compared to 0.8% among those who did not. No association was found between tic disorder and use of Ritalin [Table 3].

#### DISCUSSION

The primary aim of this study was to determine the true prevalence of tic disorders in Israeli adolescents by addressing the general population, thereby avoiding the bias associated with studies of selective referral populations. The secondary aim was to evaluate the sociodemographic characteristics of adolescents with tic disorders in addition to comorbidities and help-seeking behaviors.

Our results showed that 4.4% of the adolescents reported that they had a tic disorder, as did 1.3% of their mothers. These prevalence rates fall within the range reported in the studies reviewed by Robertson [1] (0.4–3.8% in the 5–18 year age group) but are higher than their calculated overall rate of 1%. In a study of all tic disorders in a school setting, Comings and co-authors [13] reported a prevalence of 1.1%.

The only Israeli study addressing the prevalence of Tourette syndrome was conducted by Apter et al. [14] in 1993 and yielded relatively low rates of 4.3/10,000 for males and 4.9/10,000 for females. The study population consisted of older adolescents being screened for army recruitment.

**Table 3.** Prevalence of tic disorder by comorbidity and help-seeking behavior, according to adolescents' and mothers' reports (raw numbers and weighted percentages)

Morbidity and help-seeking behavior	Prevalence of tic disorder					
	According to adolescent reports (n=902)			According to maternal reports (n=598)		
	N	% (se)	Mann-Whitney U	N	% (SE)	Mann-Whitney U
<b>Internalizing disorder</b>						
Present	7/79	12.2 (4.6)	Z = 1.787	1/53	3.1 (3.1)	Z = 0.364
Absent	36/823	3.7 (1.1)	P = 0.074	7/545	1.1 (0.4)	P = 0.716
<b>Externalizing disorder</b>						
Present	4/36	6.8 (3.5)	Z = 1.822	2/35	7.2 (4.8)	Z = 2.321
Absent	39/866	4.3 (1.1)	P = 0.068	6/563	0.9 (0.4)	P = 0.020
<b>Any mental disorder</b>						
Present	9/106	9.7 (3.5)	Z = 1.914	2/81	3.4 (2.2)	Z = 0.952
Absent	34/796	3.7 (1.1)	P = 0.056	6/517	1.0 (0.4)	P = 0.341
<b>Learning disability</b>						
Present	11/121	7.5 (2.9)	Z = 2.799	2/87	2.8 (2.2)	Z = 0.831
Absent	26/739	3.4 (0.8)	P = 0.005	6/506	1.1 (0.5)	P = 0.406
<b>Hearing/speech impairment</b>						
Present	5/54	5.9 (2.7)	Z = 1.913	2/42	4.9 (3.4)	Z = 1.984
Absent	31/803	3.7 (0.9)	P = 0.056	6/550	1.0 (0.4)	P = 0.047
<b>Seeking help in school</b>						
Yes	17/201	8.1 (2.5)	Z = 2.708	4/123	3.1 (1.6)	Z = 2.240
No	26/686	3.4 (1.0)	P = 0.007	3/432	0.8 (0.5)	P = 0.025

The difference from the current ISMEHA findings could suggest a rise in tic disorders over the last decade or an increase in awareness and social acceptance. It is also possible that highly motivated military inductees may have hidden their symptoms from professional screeners. Additionally, the present study focused on a younger age group and analyzed all tic disorders, for which the rate would be expected to be higher than for Tourette syndrome alone. In that study [14] the prevalence of all tic disorders was 2%.

We found that the rate of tic disorders in adolescents was considerably higher according to the adolescent self-reports than the maternal reports, which is in line with Cantwell et al. [15] who found that adolescents (aged 14–18 years) reported more symptoms than their mothers, leading to more diagnosed cases.

The present study found that maternal reported tic disorder was associated with externalizing disorders, while adolescent reported tic disorder showed only a borderline significant correlation with any mental disorder. Maternal reported tic disorder was also associated with hearing or speech impairment, while adolescent reported tic disorder showed only a borderline significance with hearing/speech impairment. Adolescent reported tic disorder, but not maternal reported tic disorder, was associated with learning disabilities. These findings are in line with the substantial body of literature showing an association of tics and Tourette syndrome with adverse psychopathologies. Gorman et al. [16] evaluated comorbidities in older adolescents with a diagnosis of Tourette and found higher rates of ADHD, major

depression, learning disorder, conduct disorder, and impaired psychosocial functioning compared with controls. In addition, Kerbeshian et al. [17] found a higher prevalence of early-onset schizophrenia in patients with Tourette syndrome. In the present study, the less-than-significant association of tic disorder with other pathologies and the lack of association with internalizing behaviors, in contrast to the literature, might be explained by the small number of subjects examined. Nevertheless, the results indicate that these associations persist even in general population studies and in studies of all tic disorders, not only Tourette syndrome.

Population group was the only sociodemographic variable identified in the present study that was related to the reported tic prevalence. Arab adolescents reported a higher prevalence of tic disorder than Jewish adolescents. Most of the cohorts of Tourette syndrome evaluated in the literature to date derive from western countries. There are only a few studies from non-western areas, namely China, Japan, and the United Arab Emirates. Although some studies addressed cultural differences in tic reportage, the available literature is limited, and epidemiological data on tic disorders or Tourette syndrome are lacking for most Arabic populations. Eapen and Robertson [18] observed that rates of comorbidity oppositional defiant disorder (54.5%) and conduct disorder (20%) were higher in a UK cohort with Tourette syndrome than in a comparable cohort from Saudi Arabia and the United Arab Emirates (oppositional defiant disorder 11.4%, conduct disorder 5.7%). They attributed the difference to environmental influences, such as family stability, disciplining and parenting factors, and societal expectations. However, genetic contributions could not be ruled out.

ISMEHA = Israel Survey of Mental Health among Adolescents

The same authors [18] also noted fewer reports of distress and impairment due to Tourette syndrome in subjects from the United Arab Emirates than the UK. Apparently, cultural perceptions are an important determinant of which symptoms are considered distressing or bothersome. Furthermore, differences in awareness and detection rates of Tourette syndrome in different cultures would mean that many patients in certain geographic areas may be misdiagnosed or even not diagnosed because they do not seek medical help or they or their physician label the symptoms as “psychogenic” or a “nervous habit.” Others showed that timely medical help was extended to almost all children with Tourette syndrome in a Swedish population [19], but this was true for only 11.4% of children from the United Arab Emirates [18]. This factor is important because early identification and appropriate management of Tourette syndrome and comorbidity psychopathologies can improve overall outcome.

Interestingly, in the present study, maternal help-seeking behavior was not related to tic reportage, whereas adolescent help-seeking behavior was. It appears that not only do adolescents report more tics, they have a higher tendency than their mothers to seek help for them. This finding may indicate that mothers may overlook the presence of tics in their child or downplay their severity or emotional effects. The failure of mothers to seek medical help for their child could also lead to more missed diagnoses and more related psychopathologies.

This main limitation of this study was the small sample size. To resolve the difference in the reported prevalence of tic disorder between adolescents and mothers a larger cohort is required.

## CONCLUSIONS AND STUDY IMPLICATIONS

This study provides epidemiological data on the prevalence of tic disorder in Israeli youth. The prevalence rate ranges from 1.3% according to maternal reports to 4.4% according to adolescents' reports. Apparently, adolescents are more likely to report their own tics than their mothers, which may signal a need for better parental education in the recognition of tic symptoms and awareness of their psychological effects. Arab/Druze adolescents appear to report more tic disorders than Jewish adolescents and show a different pattern of reportage. Cultural perceptions as well as service availability can lead to lower rates of help-seeking behaviors by patients and their parents and lower diagnosis rates by clinicians. It is known that minorities have lower rates of seeking help and this is the case also in Israel [12]. Further research is needed to clinically, geographically and ethnically characterize tic disorder in non-western cultures. Clinicians should also be alerted to the strong association of tic disorders with comorbidity psychopathologies and should pay particular attention to potential problem areas.

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