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Prevalence, comorbidities and mediators of childhood anxiety disorders in urban Turkey: a national representative epidemiological study

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Abstract

Purpose The aim of this study is to evaluate the prevalence of anxiety disorders, its correlation with sociodemographic characteristics, its comorbidities with other psychiatric disorders and its predictors in school-aged children.

Methods This study is part of a representative, multi-centered national study that is planned by the Turkish Association of Child and Adolescent Mental Health to evaluate the prevalence of psychopathology among elementary school students in Turkey between the years 2014–2015. Children are screened via Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children Present and Lifetime Version. Impairment is assessed by a 3-point Likert type scale independently by the parent and the teacher. The final sample included 5842 children with the mean age of 8.7 years.

Results The prevalence of any anxiety disorder without considering impairment is 16.7% and considering impairment is 5.2% in children according to our study. We found significant differences for comorbid Attention Deficit Hyperactivity Disorder, Disruptive Behavior Disorder, Mood Disorders, Tic Disorders, Obsessive Compulsive Disorder, Enuresis Nocturna, Encopresis, and Intellectual Disability. Having a history of paternal physical disorder, living in the regions of Marmara, Mediterranean and Black Sea were found to be the main predictors of having childhood anxiety disorders according to the logistic regression analysis.

Conclusion Better understanding of childhood anxiety disorders, comorbid conditions and predictors will result in earlier diagnosis and more appropriate treatment.

Keywords Childhood anxiety · Comorbidity · Prevalence · Epidemiology

Introduction

Anxiety disorders, which are characterized by excessive fear, anxiousness, and related behavioral problems, include separation anxiety disorder, selective mutism, specific phobia, social anxiety disorder, panic disorder, agoraphobia, and generalized anxiety disorder. While obsessive–compulsive and post-traumatic stress disorders were classified as subsets of anxiety disorders in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV), they are excluded from this category and included in different new chapters in DSM-5 [1, 2].

The risk factors of anxiety disorders include female gender, low levels of education and socioeconomic status, family history of anxiety disorders, temperament (avoidant personality trait, behavioral inhibition) in early childhood, parental psychopathology, coldness, protectiveness or authoritarianism in parenting, negative experiences, and traumatic life events in childhood [1, 3, 4].

Although anxiety disorders are among the most prevalent psychopathologies in children and adolescents, they

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are clinically underdiagnosed and commonly left untreated. Early diagnosis and effective treatment of anxiety disorders may prevent the negative effects of anxiety on academic and social functioning and the continuation of anxiety to adulthood [1, 2]. Additionally, anxiety disorders in children and adolescents were shown to be associated with comorbid psychopathologies, impaired functionality, sleep disorders, suicidal behaviors, cognitive and social insufficiencies in the long-term. Childhood onset anxiety disorders increase the risk of anxiety, depression, and substance abuse in adulthood [5]. Therefore, it is important to identify and treat anxiety disorders in childhood to prevent their negative consequences.

The cumulative prevalence of anxiety disorders in children and adolescents is 10% and lifetime prevalence of any type of anxiety disorders is about 15–20%, although the reported prevalence varied depending on the research methods used, the age range of samples and the differences in evaluation instruments [1, 6–11]. In a national cohort study by Esbjørn et al. (2010), the prevalence of separation anxiety disorder, specific phobia, social anxiety disorder, generalized anxiety disorder and other anxiety disorders were 0.4%, 0.5%, 1.1%, 1.5% and 2.4% respectively, among 13,241 Danish children and adolescents between 0 and 19 years-of-age [12]. When daily functioning impairment was considered, the prevalence of anxiety disorders was reported to be between 5 and 10% [13]. Anxiety disorders, especially specific phobia, panic disorder, agoraphobia, and separation anxiety disorder, are more common in girls. The mean age of onset of any anxiety disorder varies among different studies [2, 6]. Kessler et al. (14) reported that the onset of anxiety disorders was between 6 and 21 years (median: 11), and ages of onset were earlier for separation anxiety disorder and specific phobia (median: 7 years) and later for social anxiety disorder (median: 13 years) [14]. Panic disorder is generally seen after mid-adolescence [2, 6].

Anxiety disorders are also at the forefront of the mental illnesses reported in children during the last two years of the pandemic process. According to a current meta-analysis, global prevalence of clinically elevated anxiety symptoms in youth during the first year of the COVID-19 pandemic was 20.5% (95% CI 17.2–24.4%). This study also reported that the prevalence of clinically elevated anxiety symptoms was higher in studies collected later in the pandemic and in girls as moderators. The authors compared these findings to pre-pandemic estimates (11.6% for anxiety) and concluded that youth mental health problems during the pandemic has doubled [15].

In children and adolescents with anxiety disorders, comorbid psychiatric disorders, such as other anxiety disorders (homotypic comorbidity) and psychopathologies other than anxiety disorders (heterotypic comorbidity), are more common [6, 16–18]. Esbjørn et al. (2010) reported that the

prevalence of homotypic and heterotypic comorbidities was 2.8% and 42.9%, respectively [12]. Although the prevalence of comorbid psychiatric disorders differs with respect to the main anxiety disorder, anxiety and mood disorders are frequently seen together. In generalized anxiety disorder, other behavioral and emotional disorders, autism spectrum disorder and attention-deficit hyperactivity disorder are the most common heterotypic comorbid disorders. In children with specific phobia and social anxiety disorder, the most common comorbidities are mood disorders and autism spectrum disorders. Other anxiety disorders are most frequently comorbid with emotional disorders, autism spectrum disorders and attention-deficit hyperactivity disorder [5, 6, 19].

Only a few numbers of epidemiologic studies exist on anxiety disorders in children and adolescents in Turkey [20]. The samples were recruited from outpatient clinics or among university students in most of these studies which restricted the generalizability of the results. For these reasons, it is not possible to reach conclusions on the prevalence, risk factors and relationships with cultural elements of anxiety disorders in children and adolescents in Turkey. Larger community samples collected from multiple centers are required. In addition, this limited data on the prevalence of anxiety disorders in childhood mostly depend on self- and/or parent-reports [21, 22]. We could find only one study that evaluated the prevalence of anxiety disorders and their correlation with functional impairment using a structured interview in Turkey [23]. In this epidemiologic study, the prevalence of anxiety disorders was 13.9% including general anxiety disorder (1.7%), separation anxiety disorder (1%) and specific phobia (11%). When the presence of functional impairment was considered, the prevalence of clinically significant anxiety disorders decreased to 2.6% [23].

To the best of our knowledge, a representative, multi-centered study on the prevalence of anxiety disorders in children and adolescents is lacking in our country. In this study we aimed to evaluate the prevalence of anxiety disorders, its correlation with sociodemographic characteristics, its comorbidities with other psychiatric disorders and its predictors in school-aged children using a semi-structured clinical interview.

Methods

This study was part of a study that was planned by the Turkish Association of Child and Adolescent Mental Health to evaluate the prevalence of psychopathology among elementary school students in Turkey between the 2014–2015 years. The study protocol was evaluated and approved by the Institutional Review Board of Prof. Dr. Mazhar Osman Training and Research Hospital for Nervous and Mental Disorders (Date: 04.11.2014, No: 427). All

the participating study centers also sought and received approval from their respective institutions.

Study population

The target population as defined by all elementary school children in the Republic of Turkey for the 2014- 2015 academic year was 5.434.150 (51.2%, male) according to data from the Ministry of National Education and Turkish Statistical Institute [24, 25]. Also, those same sources reported that there are 27.544 elementary schools and 255.451 classes for the 2014–2015 academic year [24]. At the planning stage, it was observed that due to logistical, budgetary, and coordinative concerns; 30 study centers from 7 geographical regions would be able to participate in the study.

The sample size (without clustering) to predict a population prevalence of 0.15 at 95% Confidence Interval with an effect size of 0.01 (d) would require 4898 subjects [26]. The study coordinators contacted the Ministry of National Education to randomly assign schools in urban neighborhoods served by the study centers for study participation. This assignment was weighted to reflect differing population sizes. The study team was required to randomly sample 2nd, 3rd, and 4th grades of the assigned schools to fulfill their quotas. The quotas were weighted to reflect the number of residents of counties according to the number of County Representatives Selected to the National Assembly in the 2014 legal year [27]. The sampling quotas were calculated as number of representatives X 15. We multiplied the number of representatives with 15 to yield an estimate of children weighted according to population per county for the year 2014. This led to a target sample of 5415 children among 12,107 classmates. Because some study centers attempted to correct for attrition while others were unable to reach their planned targets, the ratio of final samples to targets varied between 94.07 and 200.0% and the final database included 5841 children. The final sample was thought to be appropriate for multi-level analysis correcting for clustering of children within classrooms and classrooms within schools [28].

a. Inclusion criteria

The only inclusion criteria were being enrolled as a 2nd, 3rd or 4th grade student in the schools assigned to study centers. Prior to participation the schools were contacted for student lists according to classes and the students were randomly selected from the prepared lists. In case that the student randomized could not be contacted, the next randomly assigned student was enrolled. The parents were informed of the study by class teachers as well as the study teams and those providing written informed consent were enrolled in the study. No parents declined participation.

Procedure

The sampling frame was between November 2014 and April 2015. The sampled children were not contacted per se, but evaluations were done via parent and teacher reports. The parent (mostly mother) was questioned on sociodemographic variables, the complaints of children were screened via semi-structured interview. Information about the diagnoses such as learning difficulties and intellectual disability that were not included in the diagnostic evaluation of K-SADS was obtained through unstructured interviews with parents. Also, the parent and the teacher filled the DSM-IV-Based Screening Scale for Disruptive Behavior Disorders in Children and Adolescents. Impairment was assessed via a 3-point Likert type scale (0 = None, 1 = Mild, 2 = Moderate/ Severe) independently by the parent and the teacher. The parent evaluated peer and sibling relations, academic skills, and general functioning in the home while the teacher evaluated domains including problems as a student, peer relations, achievement levels and self-esteem.

Measures

Sociodemographic form

The sociodemographic form was developed via the Study Coordinators and included questions on parental education and vocation, physical/ mental illnesses in the family and identifying information on sampled offspring.

Kiddie schedule for affective disorders and schizophrenia for school age children- present and lifetime version (K-SADS-PL)

This is a semi-structured interview developed by Kaufman and colleagues to evaluate present and lifetime psychopathology in children and adolescents according to DSM-III-R and DSM-IV criteria [27]. The reliability and validity study of the Turkish translation was conducted by Gokler and colleagues [28]. The present study team were all trained for its use. In the present study K-SADS-PL assessment was conducted via a single informant (i.e., parent).

Impairment

Impairment was assessed by a 3-point Likert type scale (0 = None, 1 = Mild, 2 = Moderate/Severe) independently by the parent and the teacher. Functional impairment criteria were scored and reported separately for each participant by their parents and teachers, regardless of the K-SADS-PL diagnosis. The parent evaluated peer and sibling relations, academic skills, and general functioning in the home, while the teacher evaluated domains that included problems as a

student, peer relations, achievement levels and self-esteem. We described "impairment" as a rating of "very problematic" in at least one domain or as a rating of "somewhat problematic" in at least two domains as per previous studies [20, 29].

Statistical analyses

SPSS 17,0 (Statistical Program in Social Sciences, SPSS Inc., Chicago, IL) was used for statistical analysis. Categorical variables were reported as number (n) and percent (%) while continuous variables were reported as mean ± standard deviation. Normality for continuous variables of the group was determined with the Shapiro–Wilk test. In comparison of normal distribution parameters, Student t test was used in the independent group. Categorical data were analyzed using the chi-square test. To evaluate the effects of the demographic variables on children with anxiety disorders, logistic regression analyses were performed with the demographic variables as independent variables. P values < 0.05 were considered statistically significant.

Results

We reported our results as with and without an additional functional impairment criterion. The main reason for that is the functional impairment criterion in DSM-IV (K-SADS-PL) is left to the judgment of the clinician and is not directly include parent's and the teacher's opinion. Therefore, we aimed to have additional criteria for daily functioning of the participants from the parents and teachers' perspective independently from the clinical interview.

The prevalence and gender differences of anxiety disorders with and without impairment

The final sample included 5842 children (51.5%, male) and the mean ages of children, mothers and fathers were 8.7 (S.D. = 1.2), 35.3 (S.D. = 5.5) and 39.3 (S.D. = 6.5) years; respectively. Demographics of the prevalence and gender differences of anxiety disorders with and without impairment and statistical results are shown in Table 1. We observed that any anxiety disorder, specific phobia, and PTSD without impairment criteria rates were significantly higher in the female group than the male group.

Comparison of demographic variables of the children with/ without any anxiety disorders

Demographic variables of the children with/without any anxiety disorders and statistics for variables are indicated in Table 2. In terms of mother's and father's educational level,

mother's history of physical disease and psychiatric, father's history of physical disease, the difference between the children with any anxiety disorders and the children without anxiety disorders was statistically significant.

Differences of comorbid psychiatric disorders in children with or without any anxiety disorders

A Chi-square test of independence was performed for comparing the frequency of comorbid psychiatric disorders in children with or without any anxiety disorders. There was a significant difference in terms of comorbid disorders (ADHD, Disruptive Behavior Disorders, Mood Disorders, Tic Disorders, Obsessive Compulsive Disorders, Enuresis Nocturne, Encopresis, and Intellectual Disability rates between the groups. Comorbid psychiatric disorders of children with or without any anxiety disorders and statistical results are given in Table 3.

Median rates and interquartile ranges for having anxiety disorders according to geographical regions

Median rates and interquartile ranges for having any Anxiety Disorder, GAD, Separation Anxiety Disorder, Social Anxiety Disorder, Panic Disorder, Specific Phobia, and Anxiety NOS according to geographical regions with and without impairment criterion are indicated in Table 4.

Predictors of having any anxiety disorders of children

To evaluate the effects of the demographic variables on children with anxiety disorders, logistic regression analyses were performed with the demographic variables as independent variables. Paternal age, presence of physical disorder in father and region of residence were entered as variables. The model fitted the data ($\chi2$ [8] = 9.7, p = 0.289, Hosmer and Lemeshow test) and model coefficients were statistically significant (Omnibus $\chi2$ [8] = 98.6, p = 0.000) while residence in South Eastern Anatolia was deemed redundant and were not entered among predictors. However, the predictors could explain only 5.1% of the variance (Nagelkerke R^2 = 0.051). According to logistic regression analysis, parental physical disorder, residence in Marmara, Mediterranean and Black Sea regions significantly increased the odds of having a childhood anxiety disorder with impairment while residence in Central Anatolia tended to increase the risk without reaching significance (Table 5).

Discussion

The prevalence of any anxiety disorder was found to be 16.7% (without considering impairment) and 5.2% (with considering impairment) in this nationwide representative

Table 1 Prevalence and gender differences of anxiety disorders with and without impairment

	Male % (N)	Female % (N)	Total % (N)	Confidence interval	Statistic P (X²)
Any anxiety disorder					
Without IC	15.5 (464)	18.1 (510)	16.7 (974)	15.74–17.65	**0.008**
With IC	5.3 (160)	5.2 (145)	5.2 (305)	4.71–5.86	NS
Separation anxiety disorder					
Without IC	4.0 (120)	4.1 (115)	4.0 (235)	3.52–4.53	NS
With IC	1.7 (50)	1.6 (44)	1.6 (294)	1.28–1.9	NS
Generalized anxiety disorder					
Without IC	2.2 (65)	2.6 (73)	2.4 (138)	1.98–2.77	NS
With IC	1.0 (29)	1.0 (27)	1.0 (56)	0.71–1.22	NS
Specific phobia					
Without IC	7.8 (230)	9.6 (269)	8.6 (499)	7.85–9.29	**0.008**
With IC	1.8 (54)	1.9 (53)	1.8 (107)	1.48–2.17	NS
Social anxiety disorder					
Without IC	2.9 (88)	3.3 (92)	3.1(181)	2.65–3.54	0.435
With IC	1.5 (45)	1.6 (45)	1.5 (90)	1.23–1.87	NS
Post-traumatic stress disorder					
Without IC	0.3 (8)	0.5 (14)	0.4 (22)	0.25–0.58	**0.044**
With IC	0.1 (3)	0.1 (4)	0.1 (7)	0.03–0.21	NS
Panic disorder					
Without IC	0.07 (2)	0.04 (1)	0.05 (3)	0–0.11	NS
With IC	0.03 (1)	0.04 (1)	0.03 (2)	0–0.08	NS
Acute stress disorder					
Without IC	0.03 (1)	0.11 (3)	0.07 (4)	0–0.14	NS
With IC	0.0 (0)	0.04 (1)	0.02 (1)	0–0.05	NS
Anxiety NOS					
Without IC	0.3 (9)	0.14 (4)	0.2 (13)	0.1–0.35	NS
With IC	0.13 (4)	0.07 (2)	0.10 (6)	0.02–0.19	NS
Selective mutism					
Without IC	0.03 (1)	0.20 (3)	0.07 (4)	0–0.14	NS
With IC	0.03 (1)	0.04 (1)	0.03 (2)	0–0.08	NS
Stuttering					
Without IC	0.40 (11)	0.60 (6)	0.30 (17)	0.15–0.43	NS
With IC	0.1(4)	0.11(3)	0.12 (7)	0.03–0.21	NS

IC Impairment criteria, *NS* Normal, *NOS* Not otherwise specified

p-value (bold) is less than 0.05 (typically ≤ 0.05) is statistically significant

sample of school-aged children in Turkey. Our results seem to be slightly higher than the results of the first prevalence study that investigated psychiatric disorders among Turkish children in 2016 [20]. The prevalence of any anxiety disorders was 13.9% and 2.6% for those with functional impairment in this study. In previous studies, the authors found the frequency of any anxiety disorders to be 8.6%, 9.1%, 2.9%, 5.7%, and 9.5% in children respectively [6, 30–33]. The prevalence rates of any anxiety disorders were found to be 6.5% by Polanczyk and colleagues in their meta-analysis [8]. Variations in prevalence rates of anxiety disorders are observed among studies. While the exact reasons for such variations remain unclear, most

research attribute them to methodological factors such as cross study differences in the age of subjects, assessment instruments, information source, diagnostic system used, or variations in the application the diagnostic criteria [34].

Kessler et al. [35] reported that specific phobia was the most common lifetime anxiety disorder with prevalence estimates usually in the 6–12% range [35]. In parallel with these studies, we found specific phobia to be the most common anxiety disorder with a prevalence of 8% among all anxiety disorder subtypes. Specific phobia and separation anxiety disorder were determined as the earliest onset of anxiety disorders before the age of 12. [35]

Table 2 Demographics and differences of the children with/ without any anxiety disorders

Demographics	Children with any anxiety disorders		Children without anxiety disorders		t−X²	p value
	%/Mean	n/ ± SD	%/Mean	n/ ± SD		
Age						
Children's age	8.71	± 1.13	8.70	± 5.34	0.42	0.675
Mother's age	34.96	± 5.09	35.31	± 5.43	− 1.08	0.281
Father's age	38.99	± 6.07	39.44	± 6.23	− 1.22	0.216
Gender						
Female	47.5%	145	48.3%	2670	0.07	0.422
Male	52.5%	160	51.7%	2859		
School grade of children						
First 3 classes	69.5%	210	68.7%	3790	0.88	0.410
Third, fourth and fifth classes	30.5%	92	31.3%	1725		
Mother's education level						
Middle school or lesser	67.5%	195	60.9%	2998	5.1	**0.014**
High school or higher	32.5%	94	39.1%	1925		
Mother's employment status						
Employed	17.9%	54	9.5%	1013	0.06	0.437
Unemployed	82.1%	247	81.5%	4459		
Mother's history of physical disease						
Has history of physical disease	17.5%	53	13.8%	762	3.2	**0.048**
Has not history of physical disease	82.5%	250	86.2%	4742		
Mother's history of psychiatric disease						
Has history of psychiatric disease	17.3%	52	10.3%	568	14.5	**0.000**
Has not history of psychiatric disease	82.7%	249	89.7%	4934		
Father's education level						
Middle school or lesser	72.5%	216	53.3%	2912	41.9	**0.000**
High school or higher	27.5%	82	46.7%	2551		
Father's employment status						
Employed	96.6%	287	97.3%	5219	0.52	0.282
Unemployed	3.4%	10	2.7%	143		
Father's history of physical disease						
Has history of physical disease	12.4%	37	3.8%	206	52.3	**0.000**
Has not history of physical disease	87.6%	262	96.2%	5276		
Father's history of psychiatric disease						
Has history of psychiatric disease	14%	42	11.4%	624	2.0	0.097
Has not history of psychiatric disease	86%	257	88.6%	4858		

p-value (bold) is less than 0.05 (typically ≤ 0.05) is statistically significant

PTSD depends on various factors including the type of trauma, the proximity to the stressor, the reaction of the child's parents and may depend upon variation in cultural and societal response to stress, coping strategies and available support. In this study, we found the prevalence of PTSD four percent. The fact that the average age of our study group covers the early childhood period, such as 8 years, may explain this low prevalence. The prevalence of PTSD is found to be lower in childhood, but higher in late adolescence and early adults [1, 34, 36].

We found that having any anxiety disorders, specific phobia and PTSD without impairment criteria rates were significantly higher in the female group than the male group. Epidemiological studies have shown that girls are more likely than boys to report an anxiety disorder and have stressed that females are about twice as likely to develop each of the anxiety disorders as their age increases [1, 6]. It is reported that specific phobia, panic disorder, agoraphobia and separation anxiety disorder are more commonly seen among girls [1].

According to our results, the mother's history of physical and psychiatric diseases and father's history of physical disease were found to be statistically different between children with and without any anxiety disorder. Our results are

Table 3 Comorbid psychiatric disorders of children with or without any anxiety disorders

Comorbid psychiatric disorders	Children with any anxiety disorders		Children without anxiety disorders		X^2	p value
	%	N	%	N		
Attention deficit hyperactivity disorder (ADHD)						
Children with ADHD	47.4	145	10.5	582	361.8	**0.001**
Children without ADHD	52.6	161	89.5	4954		
Disruptive behavior disorder (DBD)						
Children with DBD	12.7	39	2	109	136.4	**0.001**
Children without DBD	87.3	267	98	5427		
Mood disorders						
Children with mood disorders	9.5	29	1.1	63	130.1	**0.001**
Children without mood disorders	90.5	277	98.9	5473		
Tic disorders						
Children with Tic disorders	6.5	20	0.5	1013	129.4	**0.001**
Children without Tic disorders	93.5	286	99.5	5508		
Obsessive compulsive disorders (OCD)						
Children with OCD	2.3	7	0.3	16	29.5	**0.001**
Children without OCD	99.7	299	99.7	5520		
Enuresis nocturne (EN)						
Children with EN	10.8	33	1.6	86	123.8	**0.001**
Children without EN	89.2	273	98.4	5450		
Encopresis						
Children with encopresis	0.7	2	0.3	14		**0.001**
Children without encopresis	99.3	304	99.7	5522		
Learning disorders (LD)						
Children with LD	0.7	2	0.3	16	1.3	0.242
Children without LD	99.3	304	99.7	5520		
Intellectual disability (ID)						
Children with ID	2.6	8	0.4	23	26.6	**0.001**
Children without ID	97.4	298	99.6	5513		
Selective mutism (SM)						
Children with SM	0	0	0	2	0.1	0.898
Children without SM	100	306	100	5534		

p-value (bold) is less than 0.05 (typically ≤ 0.05) is statistically significant

Table 4 Prevalence and interquartile ranges for having any anxiety disorder according to geographical regions with and without impairment criterion

Regions	Prevalence of any anxiety disorder without impairment criteria (Inter-quartile range)	Prevalence of any anxiety disorder with impairment criteria (Inter-quartile range)
Marmara	22.7 (4.8)	8.0 (0.0)
Aegean	13.4 (5.7)	2.4 (3.9)
Central Anatolia	18.7 (0.0)	5.7 (2.4)
Mediterranean	13.3 (15.6)	4.0 (5.7)
Eastern Anatolia	6.9 (3.8)	0.0 (2.0)
Black Sea	29.8 (33.3)	14.9 (23.4)
Southeastern Anatolia	6.1 (8.3)	2.7 (3.3)

Table 5 Logistic regression results of having any anxiety disorders of children

Predictor	Odds ratio	95% CI	P*
Paternal age (years)	1.0	1.0–1.0	0.071
Paternal physical illness (yes)	3.1	2.1–4.5	0.000
Marmara region	3.0	1.8–5.0	0.000
Aegean region	1.4	0.8- 2.7	0.263
Central Anatolia	1.8	1.0–3.3	0.046
Mediterranean	2.2	1.2–4.0	0.013
Eastern Anatolia	0.4	0.2–1.3	0.146
Black Sea	4.6	2.5–8.6	0.000

in line with the current literature. Parental anxiety disorder and depression are also found to be risk factors for offspring developing anxiety disorders in other studies [37, 38]. In family studies, familial aggregation of anxiety disorders has been shown to be a particular risk that emerges for the off-spring when both parents are affected. According to a meta-analysis of family and twin studies, it is shown that all anxiety disorders have a significant familial aggregation [39].

We found that mother's and father's educational levels were lower among children having any anxiety disorders than children who do not have the disorder. Most data obtained in epidemiological studies on children with regard to risk factors of anxiety are directed at the socioeconomic status and psychiatric problems of the family rather than the level of education of the family [35]. Despite not having sufficient data, we could interpret that parents' low levels of education may be a part of the parent's low socioeconomic or low occupational status.

The frequency of comorbid psychiatric disorders in children with and without anxiety disorders is compared in our study. We found significant differences for comorbid ADHD, DBD, Mood Disorders, Tic Disorders, OCD, EN, Encopresis, and ID. In the current literature, anxiety disorders are found to be highly comorbid with other anxiety disorders and other psychiatric disorders including depression, ADHD, substance abuse, oppositional defiant disorder, learning disorder and language disorders [2]. The odds ratio for comorbidity with ADHD was found to be 3.0 (95% CI 2.1–4.3) in anxiety disorders [40]. Moreover, it was shown that as many as one third of children with ADHD have comorbid anxiety disorders by MTA Cooperative Group [41]. Diagnosis is suggested to be complicated by overlapping symptoms between anxiety and comorbid conditions, which could lead to underdiagnosis of the comorbid conditions [2].

We evaluated the prevalence of any anxiety disorder in children according to geographical regions and we found the highest rates in the Black Sea region. This finding could be explained by social, cultural and the region's climate differences. Culture may influence the identification and interpretation of anxiety symptoms and may be attributed to children by parents and professionals. Culture related factors are more proximal to childhood development (e.g., parenting style) and influence emergence of emotional and behavioral problems [8]. We also found that increased paternal age is also associated with a higher childhood anxiety disorder risk. A recent animal experimental study found that increasing paternal age was associated with an increase in the severity of an anxiogenic phenotype in their adult offspring [41]. The relationship between increasing paternal age and diseases such as autism and schizophrenia has been demonstrated many times in clinical studies [42]. However, more clinical studies on childhood anxiety disorders and paternal age are needed.

The main limitation of our study is the fact that it was conducted in the pre-pandemic period, between the years 2014 and 2015. Other limitations can be listed as: lack of additional anxiety scales completed by the participants in addition to the KSADS-PL diagnoses, and lack of inclusion of students from rural areas of Turkey. However, the strengths of our study are the high sample size, the nature of population-based study design with a robust methodology, and the assessments conducted by experienced experts with a reliable tool, K-SADS-PL.

Conclusion

The prevalence of any anxiety disorder without considering impairment is 16.7% and considering impairment is 5.2% in children according to our study. Any anxiety disorders, specific phobia and PTSD without impairment criteria rates were significantly higher in the female group than the male group. According to the demographic evaluations, mother's and father's educational levels, mother's history of physical and history of psychiatric diseases and the father's history of physical disease were found to be statistically different between the children with and without any anxiety disorders. We found comorbidity rates higher in children with anxiety disorders than children without any anxiety disorder. ADHD was found to be the most common comorbidity of anxiety disorders in children. Finally, when children were evaluated according to geographical regions, having any anxiety disorder, with and without impairment, was found to be highest in the Black Sea region of Turkey. Increasing data on the prevalence and risk factors would contribute to a better understanding of the importance of childhood anxiety disorders among the health care professionals. A better understanding of anxiety disorders and comorbid conditions will result in earlier diagnosis and more appropriate treatments.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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