

Psychiatric disorders and characteristics of patients in asthmatic children and adolescents

Yakup Cag¹, Funda Gumustas², Yasemin Yulaf³

¹ Department of Pediatrics, Kartal Dr. Lutfi Kirdar Training and Research Hospital, University of Health Sciences, Istanbul, Turkey

² Department of Child and Adolescent Psychiatry, Pendik Training and Research Hospital, Marmara University, Istanbul, Turkey

³ Clinic of Child and Adolescent Psychiatry, Tekirdag State Hospital, Tekirdag, Turkey

Copyright © 2020 by authors and Annals of Medical Research Publishing Inc.

Abstract

Aim: The main objective of our study is to assess the socioeconomic, prenatal, neonatal and developmental properties of asthma cases who presented to child and adolescent psychiatry clinic and to compare psychiatric diagnosis frequency in terms of age and gender groups.

Material and Methods: Patient files of 194 children and adolescents with asthma who admitted to our hospital child and adolescent psychiatry outpatient clinic. were retrospectively reviewed. Patients' age, gender, parent education level and job status, mother's pregnancy history, delivery history, developmental stages and psychiatric diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders- Fifth Edition (DSM-5) are noted.

Results: Majority of parents of asthma patients had a primary school education and 21% of mothers were working full time. About 14% of mothers reported smoking during pregnancy and 19% of children had delayed speech. In males and children with primary school age, attention-deficit hyperactivity disorder (ADHD) was frequent whereas female cases showed a higher rate of anxiety disorders.

Conclusion: The prevalence of psychiatric disorders, especially ADHD and anxiety disorders, is high in children and adolescents with asthma. The presence of difficulties in terms of sociocultural, prenatal, neonatal and developmental characteristics may increase the need to apply to the psychiatry outpatient clinics.

Keywords: Asthma; child and adolescent; psychopathology

INTRODUCTION

Asthma, which is the most commonly seen chronic disease seen during childhood, is known to be affected by multiple factors including environmental, infectious, allergic and psychogenic (1). The main signs of asthma include shortness of breath in a repetitive pattern, wheezing, coughing and tightness in chest (2). Shortness of breath, which presents itself as attacks, can negatively affect many aspects of mental health such as sleeping schedules, learning processes and developing stress coping mechanisms (3). When assessed from a causality perspective; it is still not clear whether psychiatric disorders trigger asthma or asthma triggers psychiatric disorders, or both stem from a common etiological root.

Shortness of breath, fear of getting stuck to a ventilating machine and death are all commonly seen feelings in patients with chronic respiratory system conditions (4). Likewise, psychiatric disorders such as anxiety and

depression are also more frequent in cases with respiratory diseases. Elevated anxiety levels increase feelings of shortness of breath and hyperventilation, which makes acute and chronic management of symptoms a challenge and cause a significant decrease in the quality of life of the patient (4,5). Increased respiratory difficulties also cause higher anxiety levels.

In addition to internalization disorders such as anxiety and depression, children with asthma are also reported to have ADHD more frequently than their peers (6). Hypoxia during repetitive attacks, increased respiratory load and the presence of nocturnal symptoms are all thought to be related with this increased ADHD rates in children diagnosed with asthma (7). School attendance issues caused by respiratory attacks and the accompanying learning difficulties, hyperactivity and impulsivity signs, which is also thought to be secondary to sympathomimetic treatments, are also frequent in children with asthma.

Received: 21.02.2020 **Accepted:** 10.04.2020 **Available online:** 11.06.2020

Corresponding Author: Yakup Cag, University of Health Sciences Kartal Dr. Lutfi Kirdar Training and Research Hospital, Department of Pediatrics, Istanbul, Turkey **E-mail:** yakupcag@hotmail.com

Psychosocial factors such as restricted physical activity, long-term regular medication usage requirement, weakness of family's coping strategies for the disease and inadequate social support for the child can also cause behavioral disturbances such as oppositional defiant disorder in children and adolescents with asthma as well.

The main objective of our study is to assess the sociodemographic variables, their delivery methods and their psychiatric diagnoses in child and adolescent asthma cases who presented to child and adolescent psychiatry clinic and to compare psychiatric disorder diagnosis frequency in terms of age and gender groups.

MATERIAL and METHODS

This retrospective study was performed in single center. The study population was chosen from children and adolescents aged 6-18 with asthma diagnosis who admitted to our hospital child and adolescent psychiatry outpatient clinic between June 2015 and September 2016. Two hundred six patients' files were examined and 194 patients were included in the study. Cases with moderate or advanced mental retardation (n=4) and children and adolescents with epilepsy (n=8) were excluded from the study to decrease adverse factors due to the possibility of accompanying psychiatric disorders in mental retardation and neurological disorders.

Sociodemographic data such as parents' job status, education level, marital status (together - separated), living conditions and the number of children was obtained from patient case files. All cases were assessed for any retardation in developmental stages before, during and after birth and any irregularities were noted. Diagnosis for psychiatric disorders in those cases were done based Diagnostic and Statistical Manual of Mental Disorders (DSM-5) diagnostic criteria.

Descriptive statistics in the study such as percentage, mean and standard deviation were obtained using SPSS 21.0 software. Cases were divided into two groups as primary schoolers (6-11y) and adolescents (12-18y) to research psychiatric diagnosis frequency according to age groups. Chi-square test was used in the assessment of categorical variables. Confidence interval was set at 95% and significance level was set as $p < 0.05$.

Ethical Disclosures

The study was approved by the ethic comity of Istanbul Gelisim University in Istanbul Turkey with the registration number of 14.02.2020/2020-04. It was conducted in accordance with the World Medical Association and the Helsinki Declaration. The informed parental consent was not obtained due to retrospective nature of study.

RESULTS

Mean age of cases was calculated as $9,58 \pm 3,03(6-18)$. 65.5% (n=127) of the cases were males whereas rest 34.5% (n=67) were females. Table 1 shows the sociodemographic values of all children and adolescents with asthma included in the study. When sociodemographic variables

were compared according to gender and age groups, no significant difference between groups were detected in terms of parental education level, job status, marital status or the number of children ($p > 0.05$).

Table 1. Sociodemographic properties of cases

		N	%
Mother's Employment Status	Homemaker	147	77.4
	Employed	41	21.6
	Dead	2	1.1
Mother's Education	Illiterate	8	4.3
	Primary Education	91	48.6
	Secondary Education	29	15.5
	High School	46	24.6
Father's Employment Status	University	13	7.0
	Unemployed	5	2.7
	Employed	174	93.0
Father's Education	Dead	7	3.7
	Illiterate	1	0.5
	Primary Education	83	45.3
	Secondary Education	23	12.6
Family Status	High School	57	31.1
	University	19	10.4
	Separated/Divorced	18	9.3
Number of Children	Dead	6	3.1
	Together	169	87.6
	1 Child	50	26.0
Residence	2 Children	104	54.2
	3 or more children	38	19.7
	City	116	59.8
	Town	63	32.5
	Village	15	7.7

Table 2. Perinatal characteristics, presence of developmental delay and psychiatric diagnoses of cases

	N	%
Pre-term Birth	12	6.2
Neonatal ICU history	16	8.2
Low Birth Weight	18	9.2
Smoking during pregnancy	28	14.4
Delayed Speech	38	19.5
Delayed Walking	8	4.1
No psychiatric disorder	46	23.8
ADHD	88	45.4
Behavioral Disorder	4	2.1
Autistic Spectrum Disorder	3	1.5
Oppositional Defiant Disorder	9	4.6
Depression	7	3.6
Anxiety Disorder	32	16.5
Obsessive-Compulsive Disorder	3	1.5
Psychosis	2	1.0

ICU: Intensive Care Unit; ADHD: Attention-Deficit Hyperactivity Disorder

Table 2 shows properties of children and adolescents before, during and after birth and presence of any delayed walking or speech in those cases. About 14.4% (n=28) of cases reported smoking during pregnancy. 19.5% (n=38) of child and adolescents reported delayed speech. When reviewed in terms of delivery methods and the presence of developmental delays, no significant difference was found between the groups ($p>0.05$).

When cases' DSM-5 based psychiatric diagnoses following clinical psychiatric interview and examination were reviewed; the most common diagnosis was found as attention-deficit hyperactivity disorder (ADHD) with 45.4% (n=88). Anxiety disorders came in second with

16.5% (n=32) (Table 2). 25.4% (n=49) of ADHD cases had combined type ADHD, 12.4% (n=24) had inattentive-distractable type and 7.7% (n=15) had impulsive-hyperactive type. No psychiatric diagnosis was found in 23.8% (n = 48) of the patients.

Table 3 shows the spread of psychiatric disorders in terms of gender and age groups. All subtypes of ADHD were significantly higher in males when compared to females. On the other hand, anxiety disorders were significantly higher in females. When diagnosis frequencies according to age groups were analyzed, ADHD frequency was significantly higher in primary school groups in comparison with adolescents.

Table 3. Psychiatric Diagnosis Spread according to Age and Gender

	Male		Female		P	Ages 6-11		Ages 12-18		P
	N	%	N	%		N	%	N	%	
ADHD-Inattentive Type	18	14.2	6	9.0		19	13.6	5	9.3	
ADHD-Hyperactive Type	12	9.4	3	4.5	0,001**	14	10.0	1	1.9	0,018*
ADHD-Combined	41	32.3	8	11.9		39	27.9	10	18.5	
Behavioral Disorder	4	3.1	0	0.0	0.3	3	2.1	1	1.9	0.89
Autistic Spectrum Disorder	2	1.6	1	1.5	0.72	2	1.4	1	1.9	0.83
Oppositional Defiant Disorder	7	5.5	2	3.0	0.72	6	4.3	3	5.6	0.71
Depression	3	2.4	4	6.0	0.237	3	2.1	4	7.4	0.09
Anxiety Disorder	13	10.2	19	28.4	0,001**	21	15.0	11	20.4	0.36

ADHD: Attention-deficit hyperactivity disorder * $p<0,05$; ** $p<0,001$

DISCUSSION

Mental health of the children and adolescents with asthma are thought to be negatively affected due to multiple factors including chronic prognosis of the disease, long-term medication requirements, restriction in physical activity, school attendance issues, not being able to move freely as their peers, and overprotective behavior of the parents. In our study, we reviewed socioeconomical and sociocultural levels of the families with children and adolescents with asthma, their prenatal, natal and post-natal histories, the presence of any retardation on developmental stages and their psychiatric diagnoses made by child and adolescent psychiatry clinic.

Our study sample showed that 48% of mothers and 45% of fathers have primary education, that only 21% of mothers are employed, about 92% of the families lived in cities and towns and about 74% of families had 2 or more children. Considering the education and employment levels of parents and their number of children as important socioeconomical markers; it can be said that the majority of the families within our sample group have a lower socioeconomical status. Previous studies reported relationships between socioeconomical status with both atopic diseases and depression or anxiety (8,9). Another study compared psychiatric symptoms and diagnosis levels in children with asthma according to the

education level of primary caregiver. Asthmatic children with caregivers with lower educational levels were seen to have more frequent mental issues and more severe hyperactivity symptoms (10).

When the sample group was reviewed in terms of prenatal, natal and post-natal periods, about 14% of mothers reported smoking during pregnancy. Another study done in Turkey also reported smoking during pregnancy frequency in the mothers of asthmatic children as 17% (11). Prenatal tobacco exposure was shown to increase the frequency of asthma, behavioral disorders, neurocognitive impairment and even the frequency of starting smoking during adolescent term when compared to post-natal exposure (12). About 9% of the children in the study had a low birth weight. The mentioned study showed a strong relationship between low birth weight and development of asthma in children and children with a very low birth weight were reported to be 2 times more under the risk for developing asthma when compared to children with low birth weight and 3 times more than children with normal birth weight (13). Similarly, retarded development during fetal period also causes a significant increase in mental problems in children and adolescents aged 3-14 (14). A study which reviewed behavioral symptoms in children aged 8 with very low birth weight history reported that the severity of symptoms in ADHD, especially inattentive type,

autistic spectrum disorder, Asperger's Syndrome and generalized anxiety disorder are significantly higher when compared to children with normal birth weight. The same study reported asthma diagnosis in 21% of children with very low birth weight and 9% in children with normal birth weight (15).

About 19.5% of our cases had delayed speech. A study done on children with speech impediments including delayed speech reported that respiratory system diseases such as asthma are more frequently diagnosed in children with speech impediments compared to other healthy children (16).

In our study, the most commonly diagnosed psychiatric disorder in children with asthma was found to be ADHD with 45% of the cases. About 16.5% of children and adolescents were diagnosed with anxiety an disorder, which comes as the second most common diagnosis amongst those cases. A study done in Turkey which compared asthmatic children and adolescents who are under the control of pediatric allergy and immunology clinics in terms of psychiatric disorders with healthy control group reported anxiety disorder frequency as 45.5% in those cases, which is significantly higher than controls (17). Another longitudinal study with larger sample groups compared behavioral problem levels in children with asthma with other children and reported that asthmatic children and adolescents are significantly more likely to develop hyperactivity, behavioral and emotional disorders compared to controls (10). A study which included children and adolescents with moderate and severe persistent asthma diagnosis reported anxiety disorder in 35% of the patients with 80% of them fulfilling the diagnostic criteria for generalized anxiety disorder (18).

The mentioned studies show different results when the relationship between asthma and ADHD was concerned. Biederman et al reported no significant difference between ADHD and controls in terms of developing asthma risk and that asthma risk only increased in the relatives of children diagnosed both with ADHD and asthma (19). Blackman et al reviewed developmental and behavioral problems which accompany asthma in children and reported ADHD as 2 times more frequent in asthmatic children and even 3 times in children with severe asthma, when compared to control group. They also mentioned that this might be purely coincidental or that classic symptoms of ADHD can be attributed either to asthma or the used asthma medications (20). A study conducted in primary schools about asthma frequency in children with ADHD reported asthma frequency in children with ADHD as 36%, which was 1.6 times higher than controls (21). Since our study sample consists of children and adolescents with asthma who presented to child and adolescent psychiatry and that ADHD frequency is significantly higher than the previously reported studies done in pediatric clinics; we can say that ADHD is the most common diagnosis which required psychiatric treatment in cases with asthma.

The mechanism of the high comorbidity rate of allergic disease and ADHD is not clear. Some evidence indicates that inflammatory cytokines will pass the blood-brain barrier and activate neural circuits associated with emotions and behavior. In a study using functional magnetic resonance imaging, it was reported that asthmatic patients had an activation of anterior cingulate cortex and insula which also show abnormal activation in ADHD cases (22).

3.6% of our cases were diagnosed with depression. A study which assessed depressive symptoms in adolescents with asthma reported depressive symptoms in 28% of cases. Adolescents with depressive symptoms were reported to have lower quality of life due to asthma, that they slept less; they had increased restriction in physical activity and required more frequent emergency medical assistance (23). Another larger study reported that just having an asthma diagnosis did not necessarily increase major depression risk, yet when ADHD coexists with an asthma diagnosis, there is an increased risk of developing major depression and bipolar disorder (24).

When we compared the psychiatric diagnoses of asthmatic children and adolescents in terms of gender and age groups, males compared to females and primary schoolers compared to adolescents were shown to have significantly higher levels of ADHD. When compared for anxiety disorders, females were significantly more frequently diagnosed than males. Another study which used assessment scales and a semi-structured psychiatric interview reported no significant difference in emotional disturbances in asthmatic adolescents when compared to younger age groups and found not significant difference between genders in terms of anxiety disorder and mood disorders (18). Another study done in Turkey reported no difference in terms of age or gender when they compared asthmatic children and adolescents with psychiatric conditions (17). Similar to our results, a study which included female patients aged 11-17 with asthma reported that females are likely to have at least one anxiety disorder diagnosis (25).

The main limitations of our study can be summarized as that our sample consists only of asthmatic children and adolescents who came to child and adolescent psychiatry clinic, that there is no healthy control group for comparison and no semi-structured interview techniques and assessment scales assisting diagnosis were used for the assessment.

CONCLUSION

Despite our limitations, our study is valuable as it compared asthmatic children and adolescents in terms of gender and age groups and revealed their diagnosis which required a visit to psychiatry clinics. Male and school-aged asthmatic children seem to be more frequently diagnosed with ADHD yet females are more likely to be diagnosed with anxiety disorders. In addition, our findings of lower socioeconomic levels, smoking during pregnancy and low

birth weight histories are also interesting. Children and adolescents who are under the care of pediatrics clinics for asthma should be monitored for possible psychiatric disorders as well. The parents should be educated about this subject and cases should be referred to child and adolescent psychiatrists when needed for the required preventative and therapeutic interventions.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: The study was approved by the ethic comity of Istanbul Gelisim University in Istanbul Turkey with the registration number of 14.02.2020/2020-04.

REFERENCES

1. Bateman ED, Hurd SS, Barnes PJ, et al. Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J* 2008;31:143-78
2. Beasley R, Keil U, von Mutius E. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhino-conjunctivitis and atopic eczema. *Lancet* 1998;351:1225-35.
3. Turkoglu S. Solunum sistemi hastalığı olan çocuk ve ergenlerde psikiyatrik bozukluk ve belirtiler. *Genel Tıp Derg* 2015;25:140-6
4. Sandberg S, Paton J, Ahola S, et al. The role of acute and chronic stress in Asthma attacks in children. *Lancet* 2000;356:982-7.
5. Goldney RD, Ruffin R, Fisher LJ, et al. Asthma symptoms associated with depression and lower quality of life: a population survey. *Med J Aust* 2003;178:437-41.
6. Yuksel H, Sogut A, Yilmaz O. Attention deficit and hyperactivity symptoms in children with asthma. *J Asthma* 2008;45:545-47.
7. Yuksel H. Çocukluk Çağında Astım, Dikkat Eksikliği ve Hiperaktivite Bozukluğu Nedeni midir?. *Klinik Tıp Pediatri Dergisi* 2018;10:28-31.
8. Uphoff E, Cabieses B, Pinart M, et al. A systematic review of socioeconomic position in relation to asthma and allergic diseases. *Eur Respir J* 2015;46:364-74.
9. Richardson R, Westley T, Garipey G, et al. Neighborhood socioeconomic conditions and depression: a systematic review and meta-analysis. *Soc Psychiatry Psychiatr Epidemiol* 2015;50:1641-56.
10. Hammer-Helmich L, Linneberg A, Obel C, et al. Mental health associations with eczema, asthma and hay fever in children: a cross-sectional survey. *BMJ* 2016;6:012637.
11. Turan MI, Erguven M, Ozdemir M. Alerjik rinit ve bronşial astımlı çocuklarda prenatal ve çevresel risk faktörlerinin değerlendirilmesi. *Nobel Med* 2013;9:32-7.
12. DiFranza JR, Aligne CA, Weitzman M. Prenatal and postnatal environmental tobacco smoke exposure and children's health. *Pediatrics*. 2004;113:1007-15.
13. Brooks AM, Byrd RS, Weitzman M, et al. Impact of low birth weight on early childhood asthma in the United States. *Arch Pediatr Adolesc Med* 2001;155:401-6.
14. Zubrick SR, Kurinczuk JJ, McDermott BMC, et al. Fetal growth and subsequent mental health problems in children aged 4 to 13 years. *Dev Med Child Neurol* 2000;42:14-20.
15. Hack M, Taylor HG, Schluchter M, et al. Behavioral outcomes of extremely low birth weight children at age 8 years. *J Dev Behav Pediatr*. 2009;30:122-30.
16. Keating D, Turrell G, Ozanne A. Childhood speech disorders: Reported prevalence, comorbidity and socioeconomic profile. *J Paediatr Child Health* 2001;37:431-6.
17. Turkoglu S, Kerimoglu E. Bronşial Astması Olan Çocuklarda Psikiyatrik Bozukluk ve Belirtiler. *Nöropsikiyatri Arsivi* 2012;49:218-23.
18. Vila G, Nollet-Clemencon C, De Blic J, et al. Prevalence of DSM IV anxiety and affective disorders in a pediatric population of asthmatic children and adolescents. *J Affect Dis* 2000;58:223-31.
19. Biederman J, Milberger S, Faraone SV, et al. Associations between childhood asthma and ADHD: issues of psychiatric comorbidity and familiarity. *J Am Acad Child Adolesc Psychiatry* 1994;33:842-48.
20. Blackman JA, Gurka MJ. Developmental and behavioral comorbidities of asthma in children. *J Dev Behav Pediatr* 2007;28:92-9.
21. Kwon HJ, Lee MY, Ha M, et al. The associations between ADHD and asthma in Korean children. *BMC Psychiatry* 2014;14:70.
22. Rosenkranz MA, Busse WW, Johnstone T, et al. Neural circuitry underlying the interaction between emotion and asthma symptom exacerbation. *Proc Natl Acad Sci USA* 2005;102:13319-24.
23. Shankar M, Fagnano M, Blaakman SW, et al. Depressive symptoms among urban adolescents with asthma: a focus for providers. *Acad Pediatr* 2019;19:608-14.
24. Chen MH, Su TP, Chen YS, et al. Higher risk of mood disorders among adolescents with ADHD and asthma: A nationwide prospective study. *J Affect Dis* 2014;156:232-5.
25. Katon W, Lozano P, Russo J, et al. The prevalence of DSM-IV anxiety and depressive disorders in youth with asthma compared with controls. *J Adolesc Health* 2007;4:455-63.