CASE REPORT

Impact of mood disorders in a pediatric patient with severe asthma

Federica **Ferrante** †, Federico **Motta** †, Simone **Foti Randazzese** †,*, Serena **Costantino**, Maria **Pecoraro**, Giuseppe **Crisafulli**, Lucia **Caminiti**, Sara **Manti**

* **Correspondence to:**
simone.foti.92@gmail.com. ORCID: https://orcid.org/0000-0001-7084-5605

Doi
10.56164/PediatrRespirJ.2023.23

Department of Human Pathology in Adult and Developmental Age Gaetano Barresi, Pediatric Unit, University of Messina, Messina, Italy
† Co-first Authors

ABSTRACT

Asthmatic children may be more likely to develop psychiatric disorders, including depression and anxiety, that may negatively influence the management and the degree of asthma control. We describe the case of a 15-year-old girl admitted to our Pediatric Unit for post-infectious severe asthma.
The first psychological evaluation showed an unsettled mood. Treatment with Long-Acting Beta2-Agonists (LABA)/Inhaled Corticosteroids (ICS) high dosage and anti-leukotriene was prescribed, and gradually suspended over three months without exacerbations. Psychological interviews were also performed. After a three-months follow-up, psychological tests showed a serene mood and no depression or anxiety symptoms. The resolution of depressive-anxious symptoms through psychotherapy may result in clinical improvement even in the absence of therapy for asthma, suggesting that psychological evaluation is crucial to improve the control of the disease. A close collaboration between mental health professionals and allergists could result in improved symptoms control, quality of life, overall functioning and, ultimately, decreased mortality.

IMPACT STATEMENT: A single-center experience about the role of psychotherapy and psychological tests in the management of patients with asthma.

INTRODUCTION

Asthma is the most common chronic inflammatory airway disease, significantly impacting the quality of life of children and their families (1). Asthmatic children may be more likely to develop psychiatric disorders, including depression and anxiety, that may negatively influence the degree of asthma control (2). Psychological evaluation with the administration of appropriate tests to the asthmatic patient may be helpful in the management of the disease (3). Herein, we describe the case of a patient with severe asthma who benefited from psychotherapy.

CASE PRESENTATION

A. is a 15-year-old girl admitted to our Pediatric Unit for fever and cough with dyspnea. The primary care physician prescribed oral systemic corticosteroids (OSC, betamethasone 1 mg/day), without benefit. Her clinical history was positive for obesity. She experienced episodes of wheezing, dyspnea following exercise, and bronchospasm. She did not practice any sports. Her parents were smokers.

KEY WORDS
Asthma; children; case report; mood disorders; psychotherapy.

She reported having pets at home. At the admission, general clinical conditions and vital signs were normal. On physical examination, her weight was 116 kg (+2.75 SD), height 169 cm (+1.12 SD), and Body Mass Index (BMI) 40.61 kg/m^2 (+3.39 SD). She was neglected in clothing and disinterested in social life. She also presented acanthosis nigricans in interdigital, neck and inguinal folds, pearly streaks on the abdomen and reduction of the air penetration at the thoracic auscultation, with moans and whistles. Arterial hemogasanalysis was performed: pH 7.41, pCO2 30.3 mmHg, pO2 98 mmHg, BE -1.6 mmol/l, HCO3- 23.6 mmol/l. Paper RadioImmunoSorbent Test (PRIST) and Radio Allergo Sorbent Test (RAST) documented serum total IgE levels >3000 kU/, and positivity of specific IgE for *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, *Parietaria judaica*, *Felis domesticus* and *Canis familiaris*. Cardiological evaluation and chest X-Ray (**Figure 1**) were normal; chest Computer Tomography (CT), performed because of the persistence of reduction of the air penetration at the thoracic auscultation despite antibiotic treatment, was also negative (**Figure 2**).

A psychological interview was performed to examine her emotions and cognitions, highlighting a non-serene mode tone. Laboratory tests showed neutrophilic leukocytosis (White Blood Cells 11000/mmc, Neutrophils 9460/mmc) and elevation of C-Reactive Protein (3 x N). Serum *Mycoplasma pneumoniae* IgM levels were positive; thus, antibiotic therapy with macrolides was started. Treatment with OSC (prednisone 50 mg/day) and Short-Acting Beta2-Agonists (SABA) was also administered and modulated according to the clinical course. After discontinuing therapy, spirometry with a bronchodilator (BD) reversibility test was performed (pre-BD FEV1 3.52 L *vs.* post-BD FEV1 4.01 L; pre-BD FVC 4.00 L *vs.* post-BD FVC 4.02; pre-BD FEV1/FVC 88% *vs.* post-BD FEV1/FVC 100 ~ +12%) (**Table 1**). On the 10th day, she was discharged and treatment with anti-leukotriene (10 mg/day), Long-Acting Beta2-Agonists (LABA, 100 ug/day) and Inhaled Corticosteroids (ICS, 500 ug/day) was prescribed at home. Psychotherapy was also started. Over 3 months of follow-up, no asthma flare-ups were reported; thus, LABA/ICS treatment was decreased and replaced with ICS (250 ug/day), while therapy with anti-leukotriene was suspended. In parallel, psychological tests (Raven Standard Progressive Matrices (4), Emotional Quotient Inventory Youth Version (5), Multidimensional Anxiety Scale for Children (6), Multidimensional Self Concept Scale (7)) detected a serene mode-tone, no behavioral disorders with no evidence of anxious or depressive mood.

Table 1. *Spirometric values.*

	pre-BD	post-BD
FEV1 (L)	3.52	4.01
FVC (L)	4.00	4.02
FEV1/FVC (%)	88	~100 (+12)

DISCUSSION

Asthma is the most common airway disease in the pediatric age, characterized by chronic inflammation and airway hyper-reactivity leading to cough, wheezing, difficulty in breathing, and chest tightness (1). The patho-

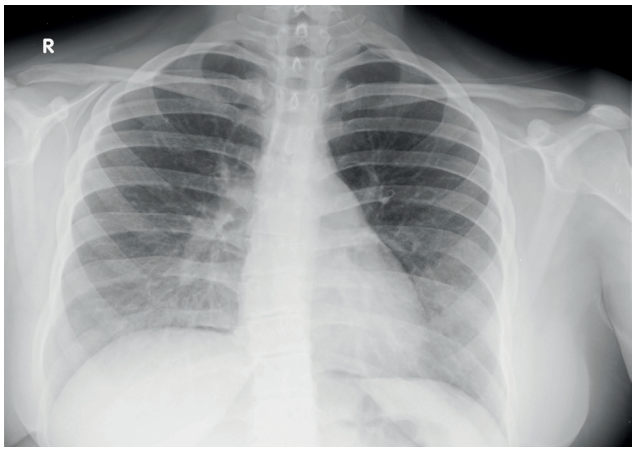

Figure 1. *Anteroposterior X-Ray of the chest.*

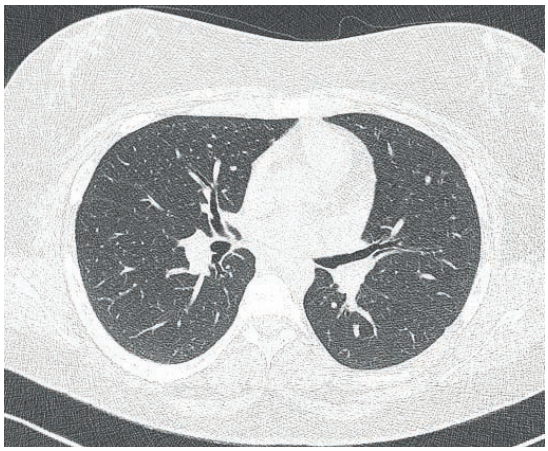

Figure 2. *Chest Computer Tomography (CT) cross section.*

physiology of asthma is complex, and bronchial hyperreactivity, inflammatory cell infiltration, release of several chemical mediators and airways structural remodeling are involved in the asthma onset (1). It is estimated that more than 300 million people worldwide are affected by asthma (8). While asthma prevails in the male sex during childhood, female subjects are most affected since adolescence (8). 5% of asthmatic patients experience a severe phenotype featured by frequent exacerbation, need for hospitalization, complications, and poor quality of life with a significant psychosocial impact (9, 10). Several analyses show the connection between mood disorders and asthma. Several causal pathways explaining the relationships between depression, risk behavior, non-adherence to treatment, and symptoms control in young people with asthma have been proposed (11). Suffering caused by the inadequately controlled disease may result in psychological disorders; depression may increase asthma symptoms through poor self-management of the disease and induce physiological changes, which, in turn, increase airway inflammation, mediated by IL-6, IL-9, and IL-13 release. Genetic predisposition to mood disorders and asthma can also significantly impact this link. Accordingly, patients with mood disorders require psychological intervention, without which any mood, behavior, or asthma control improvement is unlikely. Depression, family conflict, and non-adherence to treatment may be lethal for children and adolescents with asthma. Strunk *et al*. (12), evaluating the circumstances surrounding asthma death in children and adolescents, examined the cases of 21 patients who later died of asthma with a stepwise discriminant analysis to assess the predictive role of 57 physiological and psychological variables. The emerging risk profile of asthma death included families with histories of conflict between parents and adolescents, depressive symptoms in children and adolescent patients, family dysfunction, such as parental psychopathology or alcoholism, ignoring asthma symptoms, poor self-care, and adherence. Bender and Zhang (13) evaluated how psychological status may influence asthma control in 104 subjects, aged 6 to 18 years, through questionnaires completed separately by children and parents to assess asthma symptoms and mood disorders (anxiety and depression). Contextually, adherence to therapy was assessed through electronic devices attached to inhalers. Higher negative affective scores were associated with more frequent symptoms. High anxiety and depression scores were significant predictors of absences from school. One potential explanation of the relationship between negative affective states and asthma symptoms could be found in poor treatment adherence in response to mood disorders, resulting in decreased disease control. To test this possibility, authors evaluated the relationship between therapy adherence and symptom control and objective health events (peak prednisone use, school absences, and emergency room visits). Results showed that adherence was not significantly associated with either symptom reported by children or parents. Non-adherence was associated with increased CS use. In summary, non-adherence predicted CS use but not subjective symptoms. Kulikova *et al*. (3) suggested that anxiety and depressive symptoms may be associated with worsened asthma outcomes, such as asthma control and quality of life. Anxiety emerged as the most important predictor of poor asthma outcomes, particularly in girls, suggesting that girls may perceive asthma more negatively than boys and be more anxious about the disease. Anxiety also may affect daily quality of life, worsening the perception of asthma symptoms and increasing the emotional burden associated with it. These findings suggest that it may be essential to screen asthmatic children and adolescents for depressive and anxiety symptoms, as well as assess the asthma-related quality of life in structured formats, as part of routine asthma management. Recently, Plaza-González *et al*. (2) highlighted that asthma is a disease with a psychosomatic basis, so negative psychological and sociocultural factors may negatively influence the quality of life of pediatric asthmatic patients. Children with asthma are more often obese or overweight, they have impaired immune systems and sleep quality, and their health is further compromised if they are bullied or harassed at school. Asthmatic children generally perform worse academically and have lower socioeconomic status than healthy children. Dysfunctional family and social relationships in asthmatic children negatively influence asthma management and quality of life, so it is important to identify these risk factors and psychological comorbidities, aiming to achieve a better control of the disease. Treatment options may include cognitive behavioral therapy, psychoeducation, relaxation, drug treatment and biofeedback (14).

In conclusion, a psychological evaluation may be necessary to improve asthma control; the resolution of depressive-anxious symptoms through psychotherapy may result in clinical improvement even in the absence of asthma therapy, particularly among a specific cluster of patients with associated risk factors.

ACKNOWLEDGEMENTS

We thank our patient, her parents, and the psychologist of our Center for the precious collaboration.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interests

The Authors have declared no conflict of interests.

Financial support

There were no institutional or private fundings for this article.

Author contributions

FF, FM and SFR wrote the manuscript. MP contributed to the discussion. GC and SC collected the references. SM and LC reviewed the manuscript. Each Author listed on the manuscript has seen and approved the submission of this version of the manuscript and takes full responsibility for the manuscript. All the Authors read and approved the final manuscript.

Ethical approval

Human studies and subjects

The manuscript was written according to Good Clinical Practice and in compliance with the Declaration of Helsinki with successive amendments.

Animal studies

N/A.

Data sharing and data accessibility

The data underlying this article can be shared just before a reasonable request to the Corresponding Author.

Publication ethics

Plagiarism

The contents of the article are original and any overlaps with other articles are by the Authors themselves and appropriately cited.

Data falsification and fabrication

All the data correspond to the real.

REFERENCES

1. Papi A, Brightling C, Pedersen SE, Reddel HK. Asthma. Lancet. 2018;391(10122):783-800. doi: 10.1016/S0140-6736(17)33311-1.
2. Plaza-González S, Zabala-Baños MDC, Astasio-Picado Á, Jurado-Palomo J. Psychological and Sociocultural Determinants in Childhood Asthma Disease: Impact on Quality of Life. Int J Environ Res Public Health. 2022;19(5):2652. doi: 10.3390/ijerph19052652.
3. Kulikova A, Lopez J, Antony A, Khan DA, Persaud D, Tiro J, et al. Multivariate Association of Child Depression and Anxiety with Asthma Outcomes. J Allergy Clin Immunol Pract. 2021;9(6):2399-405. doi: 10.1016/j.jaip.2021.02.043.
4. Raven JC. SPM Standard Progressive Matrices. Giunti Italian Edition, Italy, 2008.
5. Bar-On R. Emotional on social intelligence Insights from Emotional Quotient Inventory (EQ-i). In Bar-On and JDA Parker, The handbook of emotional intelligence: Theory, development, assessment, and application at home, school, and in the workplace. Jossey-Bass, San Francisco, CA, 2000;pp:363-88.
6. March JS. MASC-2 Multidimensional Anxiety Scale for Children Second Edition. Multi Health System Inc (MHS), USA, 2013.
7. Bracken BA. MSCS Multidimensional Self Concept Scale. PRO-ED, 1992, translated by Erickson Edition, Austin Texas, USA, 2003.
8. Nunes C, Pereira AM, Morais-Almeida M. Asthma costs and social impact. Asthma Res Pract. 2017;3:1. doi: 10.1186/s40733-016-0029-3.
9. Castagnoli R, Marseglia A, Brambilla I, Marseglia GL, Licari A. Severe uncontrolled asthma in children: practical approach on diagnosis and management. Minerva Pediatr. 2020;72(3):196-205. doi: 10.23736/S0026-4946.20.05818-1.
10. Licari A, Ciprandi R, Marseglia G, Ciprandi G. Anxiety and Depression in Adolescents with Severe Asthma and in Their Parents: Preliminary Results after 1 Year of Treatment. Behav Sci (Basel). 2019;9(7):78. doi: 10.3390/bs9070078.
11. Bender BG. Risk taking, depression, adherence, and symptom control in adolescents and young adults with asthma. Am J Respir Crit Care Med. 2006;173(9):953-7. doi: 10.1164/rccm.200511-1706PP.
12. Strunk R, Mrazek DA, Wofson Fuhrmann G, LaBrecque J. Physiological and psychological characteristics associated with deaths from asthma in childhood: a case-controlled study. JAMA. 1985;254(9):1193-8. doi:10.1001/jama.1985.03360090083025.
13. Bender B, Zhang L. Negative affect, medication adherence, and asthma control in children. J Allergy Clin Immunol. 2008;122(3):490-5. doi: 10.1016/j.jaci.2008.05.041.
14. Arjun P. Mood disorders in asthma - There is more to it than meets the eye. Pulmon. 2021;23(2):75-7. doi: 10.4103/0973-3809.364147.