Original Article

Prevalence of emotional and behavioral disorders in adolescents with asthma*

Prevalência de transtornos emocionais e comportamentais em adolescentes com asma

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Abstract

Objective: To determine the prevalence of emotional and behavioral disorders in adolescents with asthma and to compare it with that of adolescents without asthma. **Methods:** A transversal study using the Strengths and Difficulties Questionnaire, administered to adolescents with or without asthma, ranging from 14 to 16 years of age and randomly selected from schools in the city of Belo Horizonte, Brazil. **Results:** The prevalence of emotional and behavioral disorders in adolescents with and without asthma was 20.4% (95% CI: 14.5-27.8%) and 9.0% (95% CI: 6.1-12.8%), respectively. Among adolescents with asthma, 56.6% (95% CI: 48.3-64.5%) presented normal scores, and 23.0% (95% CI 16.8-30.7%) presented borderline scores. Among adolescents without asthma, 75.0% (95% CI: 69.7-79.6%) presented normal scores, and 16.0% (95% CI: 12.2-20.7%) presented borderline scores. The median total score on the questionnaire was 14 and 12 among subjects with and without asthma, respectively ($p < 0.01$). In the final logistic regression model, adjusted for socioeconomic variables, the association between emotional/behavioral disorders and the following variables remained significant: being female (OR = 1.98; 95% CI: 1.10-3.56; p = 0.02) and having asthma (OR = 2.66; 95% CI: 1.52-4.64; p = 0.001). **Conclusion:** The prevalence of emotional and behavioral disorders is higher in adolescents with asthma than in those without asthma, underscoring the need for a holistic, interdisciplinary approach.

Keywords: Asthma; Epidemiology; Prevalence; Adolescent; Psychology; Behavioral symptoms.

Resumo

Objetivo: Determinar a prevalência de transtornos emocionais e comportamentais em adolescentes com asma e compará-la com a prevalência em adolescentes sem asma. **Métodos:** Estudo transversal através de um questionário de transtornos psicológicos (*Strengths and Difficulties Questionnaire*) aplicado a adolescentes de 14 a 16 anos, com e sem asma, selecionados aleatoriamente em escolas municipais de Belo Horizonte (MG) Brasil. **Resultados:** A prevalência de transtornos emocionais e comportamentais em adolescentes com e sem asma foi 20,4% (IC95%: 14,5-27,8%) e 9,0% (IC95%: 6,1-12,8%), respectivamente. Entre os adolescentes com asma, 56,6% (IC95%: 48,3-64,5%) apresentavam escores dentro da faixa de normalidade e 23% (IC95%: 16,8-30,7%), valores limítrofes. Entre os que não tinham asma, 75,0% (IC95%: 69,7-79,6%) apresentavam escores normais e 16,0% (IC95%: 12,2-20,7%), limítrofes. A mediana no escore total do questionário foi 14 nos portadores de asma e 12 nos sem asma ($p < 0,01$). Na análise multivariada (regressão logística), controlado para variáveis socioeconômicas, permaneceram significativas as associações entre transtornos emocionais e comportamentais e as seguintes variáveis: sexo feminino (OR = 1,98; IC95%: 1,10-3,56, p = 0,02), e ter asma (OR = 2,66; IC95%: 1,52-4,64, p = 0,001). **Conclusão:** A prevalência de transtornos emocionais e comportamentais em adolescentes portadores de asma é significativamente maior do que naqueles que não tem asma, reforçando a necessidade de uma abordagem interdisciplinar e sistêmica.

Descritores: Asma; Epidemiologia; Prevalência; Adolescente; Psicologia; Sintomas comportamentais.

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Introduction

It is understood that adolescence is a period of transformation, and that changes in mood and disposition are to be expected. Within this context, asthma in adolescents can result in school absenteeism and sleep disorders, as well as putting limitations on physical exercise and interfering with family and social relationships. Having asthma in adolescence, a period during which the personal and social identity is formed, can be interpreted as being different, causing considerable emotional distress, since 'being one of the gang' is what is most desired.[1,2]

The relationship between asthma and emotional factors has long been studied. In 1892, Osler wrote that there was a strong neurotic element in most asthma cases.[3] In the 1940s, another group of authors, influenced by the Freudian psychoanalytical theory, proposed that asthma symptoms are the symbolic representation of unconscious conflicts.[4] In the 1970s, various studies on psychosomatic medicine underscored the role of psychological factors in the triggering of asthma attacks. It was postulated that mothers of children with asthma had difficulties in finding a balance between caring for their babies and responding to excessive internal/external stimulation.[5] The methodology used in these studies was frequently questioned, and, in many cases, the results were discrepant. Changes in the mother-child relationship could be detected in some situations but could not be generalized.[2]

Various studies also showed the relevance of psychological factors influencing asthma management. Anxiety, depression, denial (of having the disease) and family conflicts have been associated with lower compliance with the treatment, as well as with higher morbidity and mortality.[6]

Most studies on emotional/behavioral disorder (EBD) involving children and adolescents with asthma have shown that the prevalence of emotional disorders is higher in these patients than in the general population.[7-15] The majority of these studies were carried out in specialized clinics or hospitals and included only patients with persistent asthma (moderate or severe), with small convenience samples.[8-10,12] A few population-based studies have been conducted. However, since the criteria for the definition of asthma were not uniform, it is difficult to compare their results.[7,11,13,14]

In our review of the literature, we found that there were no studies on the association between asthma and EBD, using the standardized and validated International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire as the criterion for the definition of asthma.[16]

Our objective was to determine the prevalence of EBD in adolescents with asthma and to compare with that found in those without asthma, using the ISAAC questionnaire as the criterion for the definition of asthma. We also investigated the risk factors associated with EBD in the adolescents studied.

Methods

A population-based epidemiological study was carried out, in which a questionnaire on EBD was administered to adolescents with and without asthma.

The population studied included adolescents from public schools who had participated in an epidemiological investigation on the prevalence of asthma (ISAAC) carried out in Belo Horizonte, Brazil, in 2002. There were 3088 students, from 14 randomly selected municipal schools, who participated in the study (Figure 1). The participants were divided into two groups: those with asthma (n = 551) and those without asthma (n = 2537). The presence of clinical comorbidities that might interfere with the interpretation of the results was considered an exclusion criterion.

Having asthma or not was defined based on a positive or negative response, respectively, to the question of the ISAAC questionnaire regarding the incidence of recent wheezing: "Have you had any episodes of wheezing (wheezing attacks) within the last 12 months?" This questionnaire comprises eight questions regarding asthma-related symptoms. In Brazil, the translation and validation of the questionnaire were carried out by Solé et al.[17] Wheezing within the last 12 months is considered the symptom that is most appropriate for use in estimating the prevalence of asthma, since this shows the best Youden index (sensitivity + specificity – 1) and reproducibility.[16] In one study, recent wheezing reported on the ISAAC questionnaire was compared to the clinical diagnosis of 361 children evaluated by a pulmonologist.[18] In that study, the sensitivity was 85% (95% CI: 73-93%), and the specificity was 81% (95% CI: 76-86%). Two independent samples

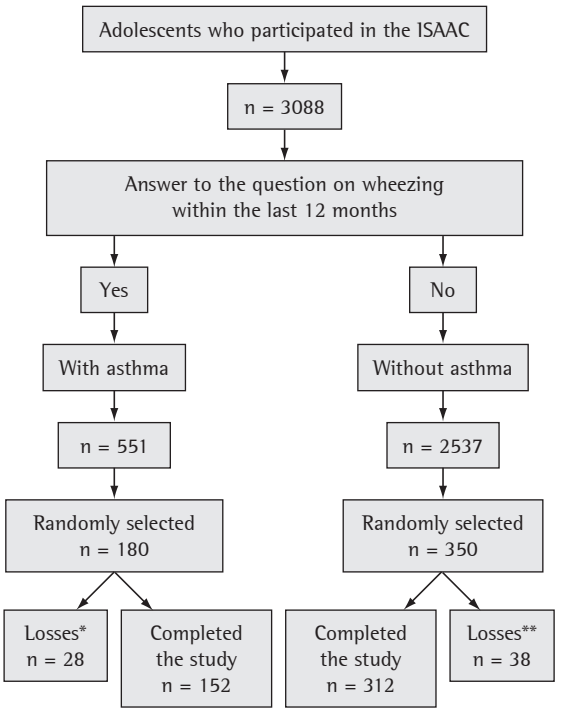

Figure 1 - Study design.

were calculated using the Epi Info 2000 program, version 3.3.2, in order to determine the prevalence of EBD in adolescents with and without asthma,[12,19] considering that the prevalence expected in the two groups was approximately 20% and 10%, respectively (95% CI and ±5% precision). The students with asthma who had answered the ISAAC questionnaire were numbered consecutively, and 180 were randomly selected from the numeric list generated by the Epi Info 2000 program. The same was done for the participants without asthma (n = 350).

The incidence of EBD was assessed using the Strengths and Difficulties Questionnaire (SDQ). This questionnaire has 25 items grouped into five domains (hyperactivity, emotional symptoms, behavioral problems, peer problems and prosocial behavior), each comprising five items. For each item, the respondent can answer 'false', 'somewhat true' or 'true'. The score for each domain is the sum of the scores of the five items and ranges from 0 to 10. The scores for the first four domains are added to generate a total difficulties score, ranging from 0 to 40. The individual is considered 'altered' if the total score is equal to or higher than 20, 'borderline' if it is from 16 to 19 and 'normal' if it is equal to or lower than 15. The prosocial behavior domain is analyzed separately. Higher scores indicate a higher frequency of prosocial behaviors.

When compared to traditional questionnaires (such as those devised by Rutter in 1967 and by Achenbach in 1991), the SDQ is relatively recent (1997). However, it has proven to provide equivalent results and to have some advantages. The main advantage is that the SDQ is better accepted by most participants, since it is shorter and focuses not only on limitations but also on abilities.[20-23] The self-report version of the SDQ (for 11- to 16-year-olds) has been validated regarding its ability to distinguish adolescents in a mental health care clinic from those in the community. The analysis of the receiver operating characteristic (ROC) curve revealed an area under the curve of 0.82 (95% CI: 0.76-0.88), which means there is a good distinction between the two populations.[21] Internal consistency was also adequate (Cronbach's alpha coefficient, 0.82).[21] In another study, the one-month test-retest reliability was determined, and the intraclass correlation coefficient was 0.85.[23]

Cultural validation was carried out in a study comprising 898 Brazilian children and adolescents, ranging from 7 to 14 years of age, to whom the SDQ was administered.[24] The participants were submitted to psychiatric evaluation. Psychiatric disorder was identified in 23 of the 41 participants with altered SDQ scores, as well as in 6 of the 40 participants with normal SDQ scores ($p < 0.001$), suggesting that the SDQ is an appropriate tool to use in screening for psychological disorders in Brazil.

The study protocol also included questions regarding demographics, socioeconomic characteristics and parental level of education, as well as where participants seek help when they are ill. Family structure was categorized as nuclear (both parents residing with the adolescent in the same household) or non-nuclear (one or both parents absent). The occupation of the head of the household was considered stable when there was a regular monthly income.

Data collection was carried out in the schools during the academic year of March to July of 2003. The principal author was present at all data collection time points. The randomly selected students were invited into a room especially selected for the study, in groups of 15, so that they would feel more comfortable. Students were asked to answer the questions honestly. It was emphasized that there were no right or wrong answers. All questionnaires were self reported. In order to avoid participant distraction or unanswered questions, the author read all of the questions aloud, without judgmental intonation that might influence the answers. The questionnaire was administered in a period of approximately 15 min.

Data analysis was carried out using the Epi Info 2000 program. The prevalence of EBD was calculated for the participants with and without asthma, and the two groups were compared. Means and medians of the total SDQ score, as well as those of each individual domain score, were also compared. Analysis of variance was used to compare means, and the Kruskal-Wallis test was used to compare medians. Means were compared when the variance was not homogeneous (Bartlett's test). The level of statistical significance was set at $p \leq 0.05$.

A univariate analysis was carried out in order to evaluate the risk factors associated with EBD, including the determination of ORs and their respective 95% CIs. Subsequently, a multivariate analysis (logistic regression) was carried out, including all variables that presented $p \leq 0.25$ in the univariate analysis.

The Ethics in Research Committee of the Federal University of Minas Gerais, as well as the Belo Horizonte Municipal Department of Education, approved the study project. After authorization from the school board, each participant and one of his/her parents gave written informed consent. The principal author returned to the schools at the end of the study in order to provide feedback to parents and teachers.

Results

General characteristics of the population

The study comprised 464 adolescents: 152 (32.8%) with asthma and 312 (67.2%) without asthma. Losses were 15.5% and 10.9% in the groups with asthma and without asthma, respectively ($p = 0.13$). There were no significant differences between the groups regarding gender or age.

Table 1 shows the demographic and socioeconomic characteristics, which were similar between the two groups.

Prevalence of EBD and comparison between means and medians of the SDQ score

The prevalence of EBD was 20.4% (95% CI: 14.5-27.8%) and 9% (95% CI: 6.1-12.8%) in the groups with and without asthma, respectively. Among the adolescents with asthma, 56.6% (95% CI: 48.3-64.5%) presented scores within the normal range, and 23% (95% CI: 16.8-30.7%) presented borderline scores. Among the adolescents without asthma, 75% (95% CI: 69.7-79.6%) presented scores within the normal range, and 16% (95% CI: 12.2-20.7%) presented borderline scores.

The median total score on the SDQ was 14 and 12 among subjects with and without asthma, respectively ($p < 0.01$). Table 2 shows the comparisons between the means of the scores for the five SDQ domains.

Evaluation of risk factors associated with EBD

Table 3 shows the results of the univariate analysis of the associations among EBD, demographics and asthma. The incidence of EBD was higher in adolescents with asthma ($p < 0.01$), in females ($p = 0.04$) and when the occupation of head of the household was considered unstable ($p = 0.04$).

In the logistic regression model, the variable of interest was the incidence of EBD, and the intervening variables were those that presented $p \leq 0.25$ in the univariate analysis. In the final model, the association between EBD and being female (OR = 1.98; 95% CI: 1.10-3.56; $p = 0.02$), as well as that between EBD and having asthma (OR = 2.66; 95% CI: 1.52-4.64; $p = 0.001$) remained significant.

Discussion

One epidemiological investigation using the SDQ comprised 4228 British adolescents ranging from 11 to 15 years of age.[23] The prevalence of EBD was 5.2%, which is lower than that found in the population without asthma (9%) in the present

Table 1 - General characteristics of the population and comparison between adolescents with and without asthma.

	With asthma (%)	Without asthma (%)	p[a]
Age			
14 years old	84 (55.2)	172 (55.1)	0.94
15-16 years old	68 (44.8)	140 (44.9)	
Gender			
Male	71 (46.7)	141 (45.2)	0.83
Female	81 (53.3)	171 (54.8)	
Maternal level of education			
≤4th grade	43 (29.0)	98 (33.7)	0.38
>4th grade	105 (71.0)	193 (66.3)	
Paternal level of education			
≤4th grade	40 (30.8)	95 (35.7)	0.39
>4th grade	90 (69.2)	171(64.3)	
Family structure			
Nuclear	90 (59.6)	198 (63.9)	0.43
Non-nuclear	61 (40.4)	112 (36.1)	
Per capita income (Brazilian reals)[b]			
<120	29 (31.2)	60 (34.8)	0.64
≥120	64 (68.8)	112 (65.2)	
Head of household occupation			
Stable	129 (87.2)	252 (86.9)	0.94
Unstable	19 (12.8)	38 (13.1)	
Number of rooms			
≤6	86 (58.5)	146 (46.3)	0.04
>6	61 (41.5)	159 (53.7)	
Sewage disposal			
Connected to the sewage system	136 (91.3)	275 (91.3)	0.88
Other	13 (8.7)	26 (8.7)	
Water supply			
Running water	126 (85.1)	254 (83.8)	0.82
Other	22 (4.9)	49 (6.2)	
Health care			
Private	46 (30.7)	98 (32.1)	0.83
Public	104 (69.3)	207 (67.9)	

[a]Chi-square test with Yates' correction; and [b]120 reals = 50% of the minimum wage at the time of the study.

study. This difference can be due either to the worse socioeconomic conditions of Brazilian adolescents, increasing the prevalence of EBD, or to cultural differences in the interpretation and expression of emotions and behaviors.

There have been few studies on the prevalence of EBD in Brazilian children and adolescents. The prevalence of EBD found in the present study (9%) is intermediate to the values reported in two other studies (13% among mild cases and 10% among moderate cases; 5.6% of complaints regarding mental health).[19,25] In another study, the SDQ was administered to parents, teachers and adolescents.[24] The prevalence of EBD ranged from 12% (in urban areas) to 22% (in slums). The use of multiple informing parties can increase the sensitivity of the SDQ.[21] Since the only source of information in the present study was the adolescents, the problem might have been underestimated. However, it has been reported that the correlation between the answers given by the adolescents and those given by parents and teachers regarding EBD is generally low.[26] Although there might be a bias due to the self-evaluation process, the adolescents are the

Table 2 - Scores for the domains of the Strengths and Difficulties Questionnaire on emotional/behavioral disorder in adolescents with and without asthma.

	With asthma		Without asthma		p[a]
	Mean (SD)	95% CI	Mean (SD)	95% CI	
Emotional symptoms	5.1 (2.6)	4.7-5.5	3.9 (2.4)	3.5-4.3	<0.01
Hyperactivity	4.7 (2.4)	4.3-5.0	3.9 (2.2)	3.6-4.3	<0.01
Behavioral problems	2.3 (1.9)	2.0-2.6	2.0 (1.7)	1.7-2.2	0.04
Peer problems	2.5 (1.8)	2.2-2.8	2.3 (1.6)	2.0-2.6	0.22
Prosocial behavior	8.3 (1.5)	8.0-8.5	7.9 (1.5)	7.7-8.1	0.03

[a]Analysis of variance; and SD: standard deviation.

individuals most suited to reporting their emotions and behaviors at home and in school, which is why we employed this particular approach to using the questionnaire.

The use of questionnaires for the detection of psychological disorders has limitations; one of which is the definition of a 'case'. Presenting EBD symptoms does not necessarily imply that there is a disease to be treated.[27] Ideally, the diagnosis should be confirmed through a structured psychiatric interview, such as those devised for the International Classification of Diseases or the Diagnostic and Statistical Manual of Mental Disorders. This was not carried out due to operational issues.

Despite these limitations, the present study revealed that adolescents with and without asthma differ regarding the incidence of EBD. The differences between the two populations in terms of EBD prevalence, as well as in the total and domain scores, confirm this hypothesis. The logistic regression model, adjusted for demographic variables, confirmed that individuals with asthma are more likely to present EBD. The random selection of participants ensured homogeneity of the groups and reinforced the comparability between the populations.

This is in agreement with the findings of most studies on the association between EBD and asthma. Despite the various methodologies adopted, most studies have shown that the prevalence of psychological disorders is higher in children and adolescents with asthma than in the general.[7-15] We chose to use the ISAAC questionnaire as the criterion for the definition of asthma because it has been administered to more than 700,000 children and adolescents from 56 countries in epidemiological investigations of asthma, which can facilitate future comparisons.[16] Since this is a more sensitive criterion, it enabled the inclusion of not only severe cases, about which there is a consensus on the relevance of psychosocial risk factors, but also mild cases, in which this relevance has been less studied and is more controversial.[15]

The prevalence of EBD in children and adolescents with asthma varies considerably, ranging from 16% to 50%, and the prevalence found in the present study (20.4%) also falls within this range.[16,20,21] In a population-based study,[7] it was reported that children and adolescents with asthma, aged 5-17 years, who present limited capability to engage in physical activities are at a high risk of EBD (OR = 2.96; 95% CI: 1.22-7.17). In the present study, the result was similar (OR = 2.66; 95% CI: 1.52-4.64). Another study involved 1528 children (4-9 years of age) with asthma, selected from emergency heath care clinics and outpatient clinics.[11] Of those 1528 children presented scores equal to or greater than 63 on the Child Behavior Checklist (CBCL). This value is considered the cutoff point for clinical severity. Since there is good correlation between the CBCL and the SDQ, this value (35%) is greater than that found in this study (20.4%), which can be partially explained by the differences in the selection criteria and in the definition of asthma. That study might also have included cases in which the asthma was more severe.

Affective disorders are the most prevalent psychiatric disorders in the general population and in individuals with asthma,[12,13] which is in accordance with our results, in which the most significant difference was found in the emotional problems domain. The mean scores in the peer problems domain were similar between adolescents with and without asthma. The mean scores in the prosocial behavior domain were higher in the group with asthma, suggesting that, although the prevalence of

Table 3 - Asthma associations with emotional/behavioral disorder, socioeconomic variables and demographic variables.

	EBD		OR	95% CI	p[a]
	Yes (%)	No (%)			
Age					
14 years old	37 (62.7)	219 (54.1)	1.43	0.78-2.62	0.27
15-16 years old	22 (37.3)	186 (45.9)			
Gender					
Male	19 (32.2)	193 (47.7)	0.52	0.28-0.97	0.04
Female	40 (67.8)	212 (52.3)			
Maternal level of education					
≤4th grade	15 (28.3)	126 (32.6)	0.81	0.41-1.61	0.63
>4th grade	38 (71.7)	260 (67.4)			
Paternal level of education					
≤4th grade	17 (34.7)	118 (47.8)	1.03	0.52-2.03	0.95
>4th grade	32 (65.3)	129 (52.2)			
Family structure					
Nuclear	30 (51.7)	258 (64.0)	0.60	0.33-1.09	0.10
Non-nuclear	28 (48.3)	145 (36.0)			
Per capita income (Brazilian reals)[b]					
<120	15 (39.5)	74 (32.6)	1.35	0.62-2.90	0.52
≥120	23 (60.5)	153 (67.4)			
Head of household occupation					
Stable	46 (78.0)	335 (88.4)	0.46	0.22-0.99	0.04
Unstable	13 (22.0)	44 (11.6)			
Number of rooms					
≤6	33 (57.9)	199 (50.4)	1.35	0.74-2.48	0.36
>6	24 (42.1)	196 (49.6)			
Sewage disposal					
Connected to the sewage system	50 (89.3)	361 (91.6)	0.76	0.28-2.16	0.61
Other	6 (10.7)	33 (8.4)			
Water supply					
Running water	45 (78.9)	335 (85.2)	0.60	0.29-1.26	0.19
Other	13 (21.1)	58 (14.8)			
Health care					
Private	18 (31.6)	126 (31.7)	1.00	0.52-1.89	0.89
Public	39 (68.4)	272 (68.3)			
Age					
14 years old	31 (52.5)	121 (29.9)	2.60	1.43-4.71	<0.01
15-16 years old	28 (47.5)	284 (70.1)			

[a]Chi-square test with Yates' correction; [b]120 reals = 50% of the minimum wage at the time of the study; and EBD: emotional/behavioral disorder.

emotional disorders is higher among these adolescents, they have good relationships with others.

The higher prevalence of EBD in females found in the present study is in agreement with other studies.[19,25] It has been reported that the social identity of females favored this finding, since females feel freer to express their problems and feelings.[28] This gender-related difference might also be due to the fact that, conversely, male adolescents tend to deny their emotional and behavioral problems. In one study, behavioral problems were reported to be more common among boys.[26] The male participants

in our study might have more frequently omitted behavioral problems, such as lying or stealing.

In disagreement with the results of another study,[24] in which the socioeconomic status was identified as one of the risk factors associated with EBD, we found no association between socioeconomic variables and the incidence of EBD. These results might be different if we compared students from public schools with those from private schools.

The association between asthma and EBD might be also due to a confounding factor that was not investigated. In a 21-year cohort study, the association between asthma and affective disorders in young adults was explained by confounding factors related to adversities faced during childhood (economic difficulties, family conflicts or abuse).[13]

It is not possible to determine a cause-and-effect relationship between asthma and EBD in cross-sectional studies. Few cohort studies have been conducted, and the results are discrepant.[13,29,30] In 1991, a prospective study was carried out in order to evaluate the children of 150 pregnant women with asthma.[29] There was a significant association between maternal insecurity, assessed at the study outset, and the onset of asthma at two years of age. However, in another cohort study comprising 100 children at high risk for developing asthma (both parents with asthma), it was reported that family dysfunction was not a predictor of asthma; on the contrary, asthma promoted family dysfunction.[30]

Emotional disorders can be one of the triggering or aggravating factors of asthma. However, data in the literature support the hypothesis that asthma leads to emotional disorders, since it is a chronic disease. Especially during adolescence, limited capability to engage in physical activities, embarrassment due to asthma symptoms, the regular use (and side effects) of medication and the anxiety caused by respiratory difficulties, as well as other factors, cause asthma to become a potential risk factor for mental health problems.

The present study revealed that adolescents with asthma present more symptoms of EBD than do adolescents in general. While treating these adolescents, health care professionals must be aware of the relevance of emotional factors and, whenever necessary, refer them to a specialist. Considering that EBD is underdiagnosed, using a simple and easily administered questionnaire, such as the SDQ, as a triage tool can be extremely helpful. Further studies on the interaction between asthma and mental health are needed. The present study underscores the need for a holistic (biopsychosocial), multidisciplinary and interdisciplinary approach to treating adolescents with asthma. Our results call for further studies evaluating the association among severity of asthma, quality of life and EBD.

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