

# Original Article

## Prevalence of bronchial asthma and related symptoms in schoolchildren in the Federal District of Brazil: correlations with socioeconomic levels\*

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### ABSTRACT

**Objective:** To evaluate the asthma prevalence in the Federal District of Brazil, using the questionnaire developed for the International Study of Asthma and Allergies in Childhood to look for correlations with socioeconomic levels. **Methods:** A total of 6437 children (3183 from six to seven years old and 3254 from thirteen to fourteen years old), attending public or private schools, were evaluated. The data were analyzed by gender and socioeconomic status (chi-square test). **Results:** The prevalence of asthma in the Federal District was 12.1% among the six- and seven-year-olds and 13.8% among the thirteen- and fourteen-year-olds ( $p < 0.04$ ). In the six-to-seven age bracket, asthma prevalence was significantly greater, and asthma-related symptoms were more frequent, among males ( $p < 0.001$ ). In contrast, asthma-related symptoms were more frequent among females in the thirteen-to-fourteen age bracket ( $p < 0.05$ ). Children belonging to the lowest socioeconomic class, as determined by the responses given on the questionnaire completed by the parents, presented the highest prevalence of asthma, regardless of age bracket ( $p < 0.001$ ). Among such children, asthma-related symptoms were also more frequent ( $p < 0.05$ ). In the thirteen-to-fourteen age bracket, the prevalence of asthma was greater among those belonging to the highest socioeconomic class ( $p = 0.001$ ). **Conclusions:** Overall, economically disadvantaged children more frequently presented asthma-related symptoms and experienced asthma attacks that were of greater severity. In addition, the prevalence of suspected asthma was higher than that of diagnosed asthma in this group, suggesting that asthma is underdiagnosed in children belonging to the lowest socioeconomic class.

**Keywords:** Asthma/epidemiology; Asthma/diagnosis; Socioeconomic factors; School health; Questionnaires

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## INTRODUCTION

The prevalence and severity of asthma, one of the most common chronic childhood diseases, has significantly increased in the last decades. Underdiagnosis and lack of adequate treatment have contributed considerably to the related high morbidity rates.<sup>(1)</sup>

As is well known, studies carried out in different countries have found significant differences in the prevalence of asthma in distinct socioeconomic regions.<sup>(2-4)</sup> It is supposed that this must also occur in Brazil, when we consider its continental dimension, with significant climatic, social and cultural differences.

Another aspect to be considered is that prevalence studies can fail to reach their objectives due to the lack of standardization in the definition of cases or limitations related to the methods used. The International Study of Asthma and Allergies in Childhood (ISAAC) is an international project devised in Australia in 1991 to determine the prevalence of asthma and allergic diseases in children and adolescents worldwide.<sup>(5-6)</sup> According to ISAAC, each participating center should use the ISAAC questionnaire, which consists of objective and defined questions (in order to allow its translation to other languages without losing its reproducibility), to evaluate 3000 children from six to seven years old and 3000 adolescents from thirteen to fourteen years old.

As has been done in other regions of Brazil, the objective of this study was to check the prevalence of bronchial asthma and related symptoms in children and adolescents, all schoolchildren in the Federal District (a quasi-state in which the national capital, Brasília, is located), as well as to determine whether there is a correlation between the prevalence found and the socioeconomic level of the population studied.

## METHODS

The Federal District is divided into administrative regions, with distinct socioeconomic characteristics, categorized by the Secretaria Estadual de Educação (State Department of Education) into three socioeconomic groups: group 1 - residents having better housing conditions and social levels, among whom over 50% have a college degree, and 82.1%

have an income of over five times the minimum wage; group 2 - residents living in intermediate conditions, 83% of whom have a high school diploma and 63% of whom have an income of up to five times the minimum wage; group 3 - residents presenting the worst social conditions, 80% of whom have not finished elementary school and 80.8% of whom have a maximum income of two times the minimum wage.

The total number of schoolchildren in each socioeconomic group was determined, as well as the percentage each group represents in public and private schools, with the help of the State Department of Education: group 1 - 69% study in private schools, and 31% study in public schools; group 2 - 83% study in public schools, and 17% study in private schools; group 3 - 99.6% study in public schools, and only 0.4% study in private schools.

The sample consisted of 6437 schoolchildren: 3183 in the six- to seven-year-old age bracket and 3254 in the thirteen- to fourteen-year-old age bracket. For data collection, the ISAAC questionnaire<sup>(3)</sup> was used in 181 public schools and 75 private schools in 1998 and 1999. In the case of the adolescents, the questionnaire was completed by the adolescents themselves, whereas it was completed by the parents or legal guardians of the younger children. For this sample, the target proportional distribution was that used by the State Department of Education.

Of the 6437 schoolchildren evaluated, there were 2082 socioeconomic group 1 children, of whom 635 (30.5%) studied in public schools, and 1447 (69.5%) studied in private schools; 3168 socioeconomic group 2 children, of whom 2505 (79.0%) studied in public schools and 663 (21.0%) studied in private schools; and 1187 socioeconomic group 3 children, all of whom studied in public schools.

The schools were chosen at random, and the project was approved by the Ethics Committee of the University Hospital of Brasília.

The data related to the "asthma module" of the questionnaire were analyzed, and the responses to each question were separated by gender and socioeconomic group.

Incomplete or incorrectly completed questionnaires were nullified. In order to avoid losses, a number of questionnaires equal to that of those nullified were administered in the same

schools, and the data were entered into a program created for the Statistical Analysis System reader. The statistical analyses were performed using the chi-square test, and the level of statistical significance was set at  $p < 0.05$ .

Suspected asthma was defined, as proposed by Ferrari et al., as that in which the individual presented four or more wheezing attacks in the previous year (one to three attacks accompanied by sleep loss) or wheezing upon exertion and dry cough at night with no infection.<sup>(7)</sup>

## RESULTS

In the Federal District, the prevalence of physician-diagnosed asthma (affirmative answer to question 6 on the questionnaire) was 12.1% in the six- to seven-year-old age bracket and 13.8% in the thirteen- to fourteen-year-old age bracket, a statistically significant difference.

In the six- to seven-year-old age bracket, 1537 (48.3%) of the children evaluated were boys, and 1646 (51.7%) were girls. The prevalence of asthma was found to be significantly higher among boys in terms of history of wheezing, number of wheezing episodes within the last year, number of asthma attacks within the last year, amount of sleep lost and being diagnosed with asthma.

In the thirteen- to fourteen-year-old age bracket, 1567 (48.2%) of the adolescents evaluated were male, and 1687 (51.8%) were female. The females presented a significantly higher prevalence of history of wheezing, wheezing within the last year, hoarseness and dry cough without concomitant infection. There was no statistically significant difference between the genders in terms of having been diagnosed with asthma. These data can be seen in Table 1.

Concerning the socioeconomic groups, a significantly higher prevalence of some asthma symptoms, such as wheezing within the last twelve months, asthma attacks within the last year, loss of sleep, hoarseness and wheezing upon exertion, was found among children in the six- to seven-year-old age bracket and of the lowest socioeconomic status, who were also more often diagnosed with asthma. In the thirteen- to fourteen-year-old age bracket, a significantly higher number of symptoms such as history of wheezing, wheezing within the last year, greater sleep and speech loss, wheezing upon exertion and dry cough at night were found among children in the lowest socioeconomic group (Table 2).

In both age brackets, the prevalence of suspected asthma was found to be significantly higher in socioeconomic group 3 than in group 2, in which it was in turn higher than that seen in group 1.

TABLE 1

Prevalence of asthma and asthma-related symptoms, by gender, among schoolchildren in the six- to seven-year-old and thirteen- to fourteen-year-old age brackets residing in the Federal District from 1998 to 1999

Question	Gender	Age (years)			
		6 a 7		13 a 14	
		Female n = 1.646	Male n = 1.537	Female n = 1.687	Male n = 1.567
History of wheezing		46,1	54,5*	45,8**	40,4
Wheezing within the last 12 months		19,9	26,7*	20,5**	18,5
Number of attacks within the last 12 months	none	81,0	73,6	78,2	80,5
	1-3	16,0	22,0*	19,2**	17,4
	4-12	2,3	3,2*	2,3**	1,9
	>12	0,7	1,0	0,4**	0,2
Sleep loss time per week	never	85,5	82,7	87,4	89,2
	<1	9,5	10,7	9,0	8,2
	>1	5,0	6,6*	3,6	2,6
Hoarseness		3,5	4,6	4,7**	4,2
Physician-diagnosed asthma		9,3	15,1*	13,6	14,0
Wheezing upon exertion		5,7	6,7	21,6	19,9
Dry cough at night		33,0	33,3	42,1**	32,0

Values expressed as percentages

\*significantly higher in males ( $p < 0.05$ )

\*\*significantly higher in females ( $p > 0.05$ )

TABLE 2

Prevalence of asthma and asthma-related symptoms, by socioeconomic group, among schoolchildren in the six- to seven-year-old and thirteen- to fourteen-year-old age brackets residing in the Federal District from 1998 to 1999

Question	Group	Age (years)					
		6 a 7			13 a 14		
		G1 n = 946	G2 n = 1.652	G3 n = 585	G1 n = 1.136	G2 n = 1.516	G3 n = 602
History of wheezing		49,3	51,0	49,1	41,6	42,6	47,8*
Wheezing within the last 12 months		19,9	22,7	30,1*	18,2	19,1	23,3*
Number of attacks within the last 12 months	none	80,2	78,0	71,4	80,3	79,4	77,3
	1-3	16,9	19,9	22,4*	17,7	18,1	19,9*
	4-12	2,3	2,2	5,0*	1,7	2,2	2,5**
	> 12	0,6	0,8	1,2*	0,3	0,3	0,3
Loss of sleep (times per week)	never	88,5	83,1	80,3	91,6	87,4	84,4
	< 1	7,6	11,2	11,1	6,3	9,3	11,3**
	> 1	3,9	5,7	8,7**	2,1	3,3	4,3**
Hoarseness		1,2	3,8	9,4**	1,9	4,4	9,3**
Physician-diagnosed asthma		11,8	10,4	17,3*	16,8***	12,7	11,0
Wheezing upon exertion		3,6	5,6	12,1**	18,6	18,6	30,4*
Dry cough at night		35,8***	32,9	29,6	33,8	35,1	49,2*

G: socioeconomic group

\*G3 greater than G1 and G2 (p < 0.05); \*\*G3 greater than G1 and G2 (p < 0.05)/G2 greater than G1 (p < 0.05); \*\*\*G1 greater than G2 and G3 (p < 0.05); Values expressed as percentages

## DISCUSSION

The prevalence of bronchial asthma found in the children and adolescents studied (12.1% for the six- to seven-year-old age bracket and 13.8% for the thirteen- to fourteen-year-old age bracket) is similar to those reported in other studies carried out in Brazil and in other countries, in which the prevalence of symptoms was found to be higher than that of physician-diagnosed asthma, indicating underdiagnosis of the disease at all of the evaluating centers.<sup>(8)</sup> In São Paulo, the prevalence of wheezing within the last twelve months was 21.3%, and the prevalence of physician-diagnosed asthma was 6.1%.<sup>(9)</sup> In Curitiba (in the state of Paraná), the prevalence of wheezing within the last twelve months was found to be 18.4%, and the prevalence of physician-diagnosed asthma was 8.6%.<sup>(7)</sup> In England, the ISAAC questionnaire was administered to 27,507 children in the twelve- to fourteen-year-old age bracket.<sup>(10)</sup> The authors of that study found the prevalence of wheezing within the last twelve months to be 33.3% and that of physician-diagnosed asthma to be 20.9%. Concerning the

children who reported nocturnal symptoms within the last year, 33.8% had not been diagnosed with asthma, suggesting a significant degree of underdiagnosis.

We also observed that, in males in the six- to seven-year-old age bracket and in females in the thirteen- to fourteen-year-old age bracket, affirmative responses predominated. In other studies employing the ISAAC questionnaire, such as that carried out in four regions of Finland<sup>(11)</sup> and involving 11,607 children aged from thirteen to fourteen years old, as well as that conducted in Canada and involving schoolchildren aged from six to seven years old, obtained similar results.<sup>(12)</sup>

When we evaluated the prevalence of asthma and related symptoms by socioeconomic group, we found the prevalence of symptoms to be much higher in socioeconomic group 3. Among six-year-olds and seven-year-olds belonging to socioeconomic group 3, the frequency of affirmative responses to questions related to wheezing within the last year, hoarseness caused by wheezing, number of asthma attacks, loss of sleep and frequency of wheezing upon exertion, as well as to

physician-diagnosed asthma, was higher than among those belonging to the other socioeconomic groups.

Among adolescents of the lowest socioeconomic status, we also observed a higher prevalence of history of wheezing, wheezing within the last year, sleep loss, hoarseness, wheezing upon exertion and dry cough at night. The prevalence of physician-diagnosed asthma was higher among the adolescents in the higher socioeconomic group, demonstrating that there was greater understanding of the disease in this group, since the questionnaires were answered by the adolescents themselves. In addition, adolescents of higher socioeconomic status have access to better quality health service, and consequently receive better clarification of the diagnosis. This difference was not found in the six- to seven-year- old age bracket, in which the questionnaires were filled out by the parents or legal guardians.

Our results clearly show a predominance of asthma symptoms in the lowest social classes, which might be due to the influence of environmental factors, such as more exposure to dust, mold, animal fur, household crowding, smoking and lack of access to proper treatment, leading to attacks of greater severity.

The number of epidemiological studies correlating social level with respiratory symptoms in children is quite limited. In a study carried out in Italy, the Italian Studies on Respiratory Disorders in Childhood and the Environment, the prevalence of asthma and respiratory symptoms was evaluated in 18,737 children and correlated with urbanization and socioeconomic level.<sup>(13)</sup> The prevalence of physician-diagnosed asthma was higher in the more urbanized regions, although socioeconomic condition was not found to correlate with wheezing or with physician-diagnosed asthma. Social level was negatively correlated with the number of hospitalizations due to asthma. In contrast to what was observed for wheezing, the prevalence of chronic cough was correlated with higher urbanization and lower socioeconomic level. These observations suggest that the environmental factors associated with the worst living conditions are more closely associated with airway irritation than with symptoms of bronchial asthma.

In a study carried out in Istanbul (Turkey), in which 2232 children were evaluated, the prevalence of asthma was 9.8% and the prevalence of wheezing was 15.1%.<sup>(14)</sup> With the objective of investigating

the effect of socioeconomic level on the prevalence of asthma, the heating systems of the houses, as well as the parental level of education and number of people in the house sharing the same bedroom, as well as family income, were evaluated. The prevalence of asthma was not affected by any of these factors.

The influence of environmental factors, especially air pollutants, has also been correlated with higher prevalence of asthma in the urban regions. Although air pollution is undoubtedly related to the worsening of allergic diseases, other factors, such as living conditions, may play an important role in the development of asthma in industrialized regions.<sup>(15)</sup>

In a study conducted in the city of Recife (in the state of Pernambuco), maternal education was evaluated, and a correlation was found between limited maternal schooling and a higher prevalence of asthma among their children.<sup>(16)</sup> The prevalence rates found in Recife were the highest reported in Brazil, rivaled only by those observed in Australia.<sup>(17)</sup>

In our study, when we defined the socioeconomic groups, we observed there were clear separations among the three levels in terms of schooling and income, as evidenced by the fact that, in group 3, over 80% of the population earned less than two times the minimum wage and had only attended elementary school. Evaluating these data related to the different socioeconomic levels, we observed an apparent association between low schooling and low income and a higher prevalence of asthma symptoms in both age brackets studied. Asthma severity was also higher in the lower classes, perhaps due to their limited access to health services and treatment, or due to the worse environmental conditions.

In a study carried out in two regions of England, the relationship between hospitalization due to asthma and poor socioeconomic conditions was evaluated.<sup>(18)</sup> Asthma-related hospitalization was strongly correlated with low social status and was higher in the poor neighborhoods for all age brackets, except for the over-65 age bracket. The authors concluded that hospitalization due to asthma was strongly correlated with social deprivation in the community, such as limited access to health service, lack of clarification regarding the disease and poor housing conditions.

One group of authors used the ISAAC questionnaire with the objective of looking for

correlations between asthma and socioeconomic deprivation among 4706 adolescents in South Africa.<sup>(19)</sup> Individuals in the groups living under better socioeconomic conditions more frequently presented a history of wheezing and were more often diagnosed with asthma. However, individuals in the groups living under lower conditions presented higher numbers of asthma attacks. These findings are consistent with the concept that higher social status is a predictor of higher asthma incidence, whereas the severity of the attacks is determined by factors related to poverty.

We can conclude that, in the Federal District, the prevalence of asthma and asthma-related symptoms remained within the values observed in the rest of the country. The observed differences related to socioeconomic status were consistent with the expected higher levels of symptom prevalence in socially underprivileged groups. In addition, since the rates of suspected asthma were significantly higher than those of physician-diagnosed asthma, we suggest that bronchial asthma is underdiagnosed in children. These high prevalence rates should be considered as indicators for the implementation of programs designed to improve education, as well as to better diagnosis and treatment of bronchial asthma among poor populations.

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