Symptoms and risk factors for asthma among piauiense schoolchildren*

Sintomas e fatores de risco para asma entre escolares piauienses

Síntomas y factores de riesgo para el asma entre escolares piauienses

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ABSTRACT

Objectives: To assess the prevalence of asthma symptoms among schoolchildren aged six to seven years in the municipality of Picos-PI; and to identify risk factors associated with the disease. **Methods:** A cross-sectional study with children aged six and seven from Picos, in November 2010 and May 2011. To collect data, we used an adapted form of the *International Study of Asthma and Allergies in Childhood*. Data were analyzed using descriptive and analytical statistics. **Results:** Among the 234 children in the study sample, 56% were female. The prevalence of the medical diagnosis of asthma was 7.7%. The following risk factors presented a statistically significant relationship with the occurrence of asthma ($p < 0.05$): wheezing after physical exercise, dry cough at night without having a cold, bronchitis, and having parents with asthma. **Conclusion:** We observed an underdiagnosis of asthma; there is a necessity for further work to be conducted with a larger sample, to examine more broadly the situation of asthma in children in the municipality of Picos – PI.
Keywords: Asthma; Risk factors; Symptoms; Child; Pediatric nursing

RESUMO

Objetivos: Analisar a prevalência de sintomas de asma entre escolares de seis a sete anos do município de Picos-PI; e identificar fatores de risco associados à doença. **Métodos**: Estudo transversal realizado com crianças de 6 e 7 anos de Picos em novembro de 2010 a maio de 2011. Para coletar os dados, foi utilizado um formulário adaptado do Internacional Study of Asthma and Allergies in Childhood. Os dados foram analisados com base na estatística descritiva e analítica. **Resultados**: Dentre as 234 crianças da amostra estudada, 56% eram do gênero feminino. A prevalência de diagnóstico médico de asma foi de 7,7%. Os seguintes fatores de risco apresentaram relação estatisticamente significante com a ocorrência de asma ($p < 0,05$): sibilos após a realização de exercício físico, tosse seca à noite sem estar gripado, bronquite, e ter pais asmáticos. **Conclusão**: Observou-se o subdiagnóstico da asma e há necessidade de que novos trabalhos sejam realizados com uma amostra maior, para analisar de modo mais amplo a situação da asma em crianças no município de Picos – PI.
Descritores: Asma; Fatores de risco; Sintomas; Criança; Enfermagem pediátrica

RESUMEN

Objetivos: Analizar la prevalencia de síntomas de asma entre escolares de seis a siete años del municipio de Picos-PI; e identificar factores de riesgo asociados a la enfermedad. **Métodos**: Estudio transversal realizado con niños de 6 y 7 años de Picos en noviembre de 2010 a mayo de 2011. Para recolectar los datos, se utilizo un formulario adaptado del Internacional Study of Asthma and Allergies in Childhood. Los datos fueron analizados con base en la estadística descriptiva y analítica. **Resultados**: De los 234 niños de la muestra estudiada, el 56% era del género femenino. La prevalencia del diagnóstico médico de asma fue de 7,7%. Los siguientes factores de riesgo presentaron relación estadísticamente significativa con la ocurrencia de asma ($p < 0,05$): sibilancias después de la realización del ejercicio físico, tos seca por la noche sin estar agripado, bronquitis, y tener padres asmáticos. **Conclusión**: Se observó el subdiagnóstico del asma y hay necesidad de que nuevos trabajos sean realizados con una muestra mayor, para analizar de modo más amplio la situación del asma en niños en el municipio de Picos – PI.
Descriptores: Asma; Factores de riesgo; Síntomas; Niño; Enfermería pediátrica.

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INTRODUCTION

Asthma is one of the most common chronic diseases that affects both children and adults. Its prevalence has increased substantially worldwide, and this has triggered numerous studies on the prevalence and characteristics of this condition. It can occur at any stage of life, however it is more common that the first symptoms appear during childhood. The phenomenon of asthma involves not only the biological aspect, but also the psychological and social aspects of interpersonal relationships, transforming them into difficult experiences for the people involved, permeated with suffering, pain and the threat of death [1].

Annually, approximately 200,000 hospitalizations occur for asthma in Brazil, thus becoming the fourth leading cause of hospitalization in the Unifed Health System (1.9% of the total in 2009), and the third leading cause of hospitalization among children and young adults. In 2009, the cost for asthma hospitalizations in the Unified Health System was 103 million Brazilian reais (USD $50 million), 1.3% of the total annual expenditure for hospitalizations, and the third largest amount spent on any single disease [2].

Asthma is defined as a chronic inflammatory disease, characterized by hyperresponsiveness of the inferior airway and by variable limitation of the airflow, reversible spontaneously or with treatment, manifested clinically by recurrent episodes of wheezing, dyspnea, chest tightness and coughing, particularly at night and in the morning upon awakening. It results from an interaction between genetics, environmental exposure to allergens and irritants, and other specific factors that lead to the development and maintenance of symptoms [3].

Asthma affects a great number of people, and has, in recent decades, increased in prevalence by 50%, with differences across various countries and regions. An international inquiry demonstrated a 21% prevalence of asthma symptoms in children between the ages of 13 and 14 years in Brazil, which was responsible for approximately 2.2 million visits to the pediatrician annually, and that is the leading cause of school absenteeism and hospitalization of children. It can still be fatal, and numerous reports refer to a tendency toward increasing asthma mortality worldwide. It is unequivocal that asthma is a public health problem that has characteristics and criteria to recommended that it be considered a priority: magnitude, vulnerability and transcendence [4].

Systematization and organization of care is necessary, based on consensus adapted to the reality of the services. In the strategy of the *Atenção Integrada às Doenças Prevalentes na Infância* (Integrated Management of Diseases Prevalent in Childhood) advocated by the World Health Organization and Pan American Health Organization, asthma was prioritized due to its magnitude in the composition of morbidity. The severity of the disease and increase in the percentage of clinical situations considered at higher risk for unfavorable outcomes are important in the analysis of asthma mortality [4].

The delay in initiating treatment for the child, due to the family not recognizing the gravity of the situation, as well as an excess of confidence in inhaled bronchodilators, to the detriment of the use of anti-inflammatories, have been implicated in the increase in asthma mortality.

In addition, many children suffer from asthma symptoms, often from the earliest years of life, and continue without a defined diagnosis and, consequently, without adequate treatment. A study conducted in Cuiaba – MT [5] showed that 40% of the children researched who presented asthma symptoms in the past 12 months had no diagnosis. The lack of diagnosis makes treatment and control of the crises difficult.

Thus, it is necessary to know the prevalence of asthma symptoms in children in the city of Picos – Piauí, so that disease control programs can be stimulated, leading to better coping with the disease and, consequently, better quality of life for its sufferers and their families.

This study aimed to investigate the prevalence of asthma symptoms among school children aged six to seven years, in public and private schools of the city of Picos – PI, and to identify risk factors associated with the prevalence of the disease in this population.

METHODS

This was a study of a descriptive nature of the transversal type. Participating in the research were 39 schools located in urban areas, which had grades that were intended for the age group studied (6 and 7 years old) and that agreed to participate in the study, granting institutional authorization.

The population consisted of all children aged six and seven, regularly matriculated in these schools. To calculate the sample size, we used the formula for cross-sectional studies with a finite population [6]: $n = (Z\alpha\ 2 * P * Q * N) / (Z\alpha\ 2 * P * Q) + (N - 1) * E2$. Where: n = sample size, Zα = confidence coefficient, N = population size, E = absolute sampling error; Q = complementary percentage (100-P); P = proportion of occurrence of the phenomenon under study.

Parameters considered were the confidence coefficient of 95% (1.96), the sampling error of 5%, and a population of 1,458 school-aged children, regularly enrolled in schools in the urban area.

The prevalence of asthma symptoms considered was 24.3% [7] (P = 0.243). Based on the application of the

formula, we identified a total sample of 234 children for public and private schools.

The children were selected proportionally, according to the number of students enrolled in each school.

In order to prevent the occurrence of any sampling bias, children were randomly selected by lottery, using the *software* "R", version 2.11.1.

For participation in the study, we adopted the following inclusion criteria: children who were 6 and 7 years of age; and, children whose parents / guardians agreed to participate in the research.

We excluded children whose parents were adoptive, as there are variables that are determined by genetic inheritance.

Data collection was conducted between November 2010 and May 2011. For data collection, we used an adapted format of the written questionnaire of the *International Study of Asthma and Allergies in Childhood* (ISAAC). This questionnaire was developed with the objective of determining the prevalence of symptoms of asthma, rhinitis and atopic eczema among school children aged 6 and 7 years and adolescents aged 13 and 14 years, translated and validated for the Portuguese language. The questionnaire, along with data about asthma symptoms, contained information about the history of childbirth, breastfeeding, the nuclear family, diseases and immunizations, information about the home, type of food, and the children's anthropometric data. The instrument was also constructed based on a dissertation project [8] and was completed with the child's primary caregiver (mother, father, grandmother and / or aunt).

Data collection was conducted in meetings at the school with the families of the children selected. However, if for some reason they missed these meetings, visits were made to their homes, with addresses provided by the school administration. The visits took place with prior permission of the person responsible for the child.

Data were collected for body weight in kg, with a precision of 100g, using Family BWF model scales (Tanita Corp., Arlington Heights, United States). Height was measured in cm, with a 1mm precision, using a portable stadiometer affixed to a flat wall, without a baseboard. Both measurements were performed in the child's own school.

First, a database spreadsheet was designed in *Microsoft Office Excel* 2007 and, later, data was transferred to the SPSS *software*, version 17.0, for statistical analysis.

The data were organized in tables and analyzed based on absolute and relative frequencies and measures of central tendency, measures of dispersion and tests of association.

The Kolmogorov-Smirnov test was applied for verification of the normality of numerical data.

Regarding the tests of association for expected frequencies greater than five, we used the chi-square test, and for expected frequencies less than five, we applied the Fisher exact test. Statistically significant associations were considered as those tests that presented with a p-value <0.05.

For conducting the study, all ethical principles contained in Resolution No. 196/96 [9] governing research involving human subjects were followed. The research project was approved by the Committee on Ethics in Research of the Federal University of Piauí (CAAE: 0242.0.045.000-10) and the parents / guardians of the child signed the Terms of Free and Informed Consent.

RESULTS

The data collected were organized by groups of responses, presented in tables and analyzed using descriptive and analytical statistics.

Of the 234 children, 59% were six years old, and 41% were seven years of age.

Table 1 – Distribution of the sample according to characterization data. Picos, 2011. n=234

Variables	f	%		
Gender				
Female	131	56.0		
Male	103	44.0		
Total	234	100.0		
Skin color				
White	97	41.5		
Black	9	3.8		
Yellow	1	0.4		
Mixed / brown	127	54.3		
Total	234	100.0		
	KS (p-value)	**Mean**	**Standard Deviation**	**Median**
Income	0.00	1043.76	1621.71	545.0
Weight	0.00	21.98	4.00	21.0
Height	0.03	1.20	0.07	1.20

KS – Kolmogorov-Smirnov Test.

According to Table 1, there was a prevalence of females (56%) in the study sample. With regard to skin color, those of mixed / brown (54.3%) and white (41.5%) skin color had the highest prevalence.

The variable "income" showed a median of R$545 Brazilian reais (USD $268). The variables "weight" and "height" presented a median of 21.0 kg and 1.20 m, respectively.

Table 2 – Distribution of the students in the sample, regarding signs and symptoms of asthma presented. Picos – PI, 2011. n= 234

Signs and Symptoms	f	%
1. Wheezing		
Yes	107	45.7
No	127	54.3
Total	234	100.0
2. Asthma		
Yes	18	7.7
No	216	92.3
Total	234	100.0
3. Wheezing after physical exercise		
Yes	29	12.4
No	205	87.6
Total	234	100.0
4. Dry cough at night		
Yes	84	35.9
No	150	64.1
Total	234	100.0
5. Bronchitis		
Yes	37	15.8
No	197	84.2
Total	234	100

According to the data in Table 2, of the total number of children assessed, 45.7% had experienced a wheezing crisis sometime in their lives, and 15.8% had experienced bronchitis. In the past 12 months, 12.4% presented with wheezing after physical exercise, and 35.9% had a dry cough at night. However, only 7.7% of the children had the medical diagnosis of asthma.

Of the 107 children (45.7%) who presented with wheezing at any point in life, 48 (44.9%) experienced wheezing in the past 12 months.

After statistical analysis, it was found that only some variables presented a statistically significant relationship with the presence of a medical diagnosis of asthma among the children researched. According to the data in Table 3, having presented with wheezing after physical exercise increased by 23 times the risk of developing asthma; experiencing dry cough at night without having a cold or respiratory infection represented a three times greater risk of having asthma; and, having presented with bronchitis increased this risk by eight times.

The children who had an asthmatic mother had a risk of developing asthma that was seven times higher, and having a father with asthma increased the risk three times.

The other variables that commonly are presented in the literature as risk factors did not present a statistically significant relationship with the presence of a medical diagnosis of asthma, such as: male gender, type of delivery, birth weight, breastfeeding, exposure to allergens, passive smoking and socioeconomic status. This could have been occasioned by the possibility of high underdiagnosis of asthma, because, although the children presented a high prevalence of asthma symptoms, only 7.7% said they had an established medical diagnosis.

Table 3 – Relationship between asthma symptoms / risk factors and a medical diagnosis of asthma. Picos, 2011. n= 234.

Symptoms of asthma / Risk Factors		Asthma		p-value	OR [1] (95% CI [2])
		Yes	No		
Having presented with wheezing after physical exercise	**Yes**	12	17	0.000 **	23.412 (7.809 to 70.193)
	No	6	199		
Dry cough at night without a cold or respiratory infection	**Yes**	11	73	0.020*	3.078 (1.145 to 8.273)
	No	7	143		
Having presented bronchitis	**Yes**	10	27	0.000 **	8.750 (3.176 to 24.105)
	No	8	189		
Children with asthmatic mother	**Yes**	5	11	0.004 *	7.168 (2.166 to 23.716)
	No	13	205		
Children with asthmatic father	**Yes**	4	15	0.046 *	3.829 (1.120 to 13.083)
	No	4	201		

[1]Odds Ratio, [2] Confidence Interval, * Fisher's exact test; ** Pearson Chi-square test

Table 4 – Characteristics of the sample according to the severity of asthma in the past 12 months. Picos, 2011. n=48

Questions that reflect the severity of asthma in the last year	f	%
Wheezing crisis in the past 12 months		
None	1	2.1
1 to 3 times	41	85.4
4 to 12 times	6	12.5
Total	48	100.0
Disturbed sleep		
Never	23	47.9
Less than one night per week	15	31.3
One or more nights per week	10	20.8
Total	48	100.0
Wheezing strong enough that it prevents ability to speak more than two words per breath		
Yes	12	25.0
No	36	75.0
Total	48	100.0

According to the data in Table 4, of the 48 children who presented with wheezing in the past 12 months, the vast majority (85.4%) had one to three crises in the last year; 47.9% never had their sleep disturbed by wheezing crises, and 25% had wheezing strong enough that it prevented them from saying more than two words with each breath.

According to the data obtained in this study, it was observed that 44.9% of children had a birth weight between 2500 and 3499 grams, 86.3% were born on the expected delivery date, and the normal term was the prevalent type of delivery (54.3%).

Table 5 – Distribution of the sample according to childhood characteristics. Picos, 2011. n=234

Variables	f	%
Breastfeeding		
Yes	220	94.0
No	14	6.0
Total	234	100.0
Duration of breastfeeding		
Not breastfed	14	6.0
Less than 6 months	52	22.2
6 to 12 months	59	25.2
More than 1 year	109	46.6
Total	234	100.0
Time of exclusive breastfeeding		
Not breastfed	14	6.0
Less than 6 months	124	53.0
6 to 12 months	84	35.9
More than 1 year	12	5.1
Total	234	100.0

According to the data in Table 5, the vast majority of children (94.0%) was breastfed, 46.6% were breastfed for more than a year of life, and 53.0% were exclusively breastfed for less than six months.

DISCUSSION

The present study demonstrated, for the first time, the prevalence of asthma symptoms among school children in the city of Picos – PI, and these results are extremely important for obtaining information about asthma and the risk factors related to it, aimed at the initiation of preventive measures that promote an improved quality of life for children with the disease. Some of this data should be viewed with caution due to the small sample size.

Studies indicate a higher prevalence of childhood asthma encountered in the male gender. This can be explained by difference in the anatomy of the lower respiratory tract, because the boys have a smaller diameter, higher airway tone, and lower pulmonary blood flow in relation to females [10]. The inversion in adolescence is possibly caused by hormonal factors [11].

In regard to gender, the results of this study showed that there was a female predominance (56%). Results were similar in a study with the same age range, conducted in Pelotas – RS, which showed a predominance of females (9 – 52.8%)[12].

As for skin color, 41.5% of respondents stated that the child's color was white, and the children's mothers represented the majority of the respondents (71.8%). The result is similar to the study conducted in Pelotas (RS), in which the white skin color (74.7%) was in the majority; however, in the association with asthma, we found a 64% higher risk of asthma among non-white children compared to white children, after adjustment for socioeconomic factors [12].

In the present study, the median height of children was 1.20 meters (± 0.07) and the median weight was 21.0 kg (± 4.00). Asthma has been established as one of the causes of low birth weight and growth retardation in children [13]. In a study that was related to body mass index in asthmatic children, there was a more significant prevalence of underweight (≥ 95th percentile) in the group of asthmatic children than in the control group [14]. However, in this study there was no evidence of a statistically significant relationship between asthma diagnosis and change in weight and / or height of the child. The fact that there was a low prevalence of the diagnosis of asthma is postulated as a possible explanation, despite the high presence of asthma symptoms.

In this study, the citing of wheezing ever in life was 47.3%, which differs from one study [15] conducted in

public schools in the western region of the city of São Paulo-SP (55.2%), by being somewhat smaller.

The presence of wheezing in the past 12 months, in this study, was 42.3%, which is high compared with other studies [11, 16], in which the value ranged from 12.7% to 25.2%.

Another way to diagnose asthma, according to the ISAAC study, would be the direct investigation of the disease, that is, by the inquiry about a medical diagnosis of asthma before the research. In the present study, we found a small number of family members referring to the history of a diagnosis of asthma (7.7%), a value much lower to that found in regard to the question about wheezing in the past year (44.9%). This demonstrates the probable existence of underdiagnosis of the disease in Picos-PI, similar to what has been observed in another study [15], in which the value of the question, wheezing in the last year, was four times higher than that obtained in the question about a history of asthma at any time in their life.

When asked if there was "wheezing after physical exercise" and whether they experienced "dry cough at night without having a cold or respiratory infection" in the past 12 months, 12.4% and 35.9% responded affirmatively to these questions, respectively. These results are similar to those found by the ISAAC study conducted in Montes Claros-MG [17], with a prevalence equal to 16% and 32.9%, respectively. These data are important because nocturnal dry cough is an important manifestation of asthma, particularly in the absence of respiratory tract infection [5] and exercise-induced asthma could remain as the only manifestation of the disease in this age group, not always recognized by guardians and teachers [18]. It is noteworthy that nocturnal dry cough may be a manifestation of gastroesophageal reflux [19] and, thus, overestimate the positive prevalence for this question.

In the current study, the prevalence of asthma symptom severity assessed by the questions, number of wheezing crises, difficulty in speaking and sleep disturbance due to wheezing in the past year, presented a high percentage with relationship to other studies, of 85.4%, 25%, and 31.3%, respectively. However, according to the methodology of the ISAAC study, the sample size necessary to detect differences in the severity of asthma should be 3,000 participants, and as the current study was conducted with a sample of 234, an increase in the percentage of the variables presented above does not necessarily signify the severity of symptoms among school children in the city of Picos [7].

It is common for the population to refer to asthma by the name of bronchitis and it is also noteworthy, today, that the terms asthma and bronchitis are erroneously used as synonyms by many physicians, making the correct diagnosis of the patient difficult [20]. In this study, the prevalence of bronchitis at least once in life was 15.8%, which was larger in relation to the question about a history of asthma in life, with only 7.7%.

The prevalence of asthma and socioeconomic status are evaluated in many studies. In a random sample of 1,073 households in the city of São Paulo-SP [21], with children under five years, a relationship was found between recent wheezing and low income *per capita* and, according to this study, the poor had a risk that was three times greater of having asthma. Other authors [22] assessed the prevalence of asthma and related symptoms in the Distrito Federal – DF, and its relationship with socioeconomic status, and concluded that economically disadvantaged people had a higher prevalence of asthma symptoms, as well as more severe crises.

With regard to family income, in the present study, we found a median value of R$ 545.00. This was an amount equivalent to the minimum wage at the time (R$ 545.00). This reflects the reality of the country, where the majority of people still have a very low monthly income.

With regard to the child's birth weight, in this study most children (44.9%) had a birth weight between 2500 and 3499 grams. Some authors [23] in a literature review study found a relationship of risk between weight less than 2500 grams and asthma in the majority of articles evaluated. One of the hypotheses for the association between asthma and low birth weight is the role of pulmonary function, namely, children with low birth weight may have decreased pulmonary function and, consequently, develop symptoms of asthma; on the other hand, these children may have asthma with low birth weight alone, without pulmonary function having a mediating role in this association.

Heredity exercises an important role in asthma, in which the occurrence of asthma in parents is an important predictive factor for the children. In a prevalence study [12] nested in a cohort of 494 children from Pelotas – RS, aged 6 and 7 years, the family history of asthma was evaluated, considering the mother, father and siblings; they encountered a risk of developing asthma that was 2.8 times greater in association with this variable.

With regard to the presence of allergic disease in the parents of children researched, the present study showed that 16 mothers (6.8%) and 19 fathers (8.1%) had asthma. Moreover, this was a risk factor that showed a statistically significant relationship, in that having an asthmatic mother represented a risk seven times higher for developing asthma, and having an asthmatic father increased the risk three times.

CONCLUSION

The research participants were 234 children, predominantly female (56%). The prevalence of asthma (7.7%) presented lower values when compared to the prevalence of wheezing in the past 12 months (44.9%).

The low frequency encountered of a medical diagnosis of asthma suggests that this is still underdiagnosed.

The symptoms related to asthma presented the following values: 45.7% for wheezing sometime in life; 12.4% for wheezing after physical exercise; and 35.9% for dry cough at night. Although the prevalence of asthma symptoms was higher when compared to other studies, it is necessary to consider that, due to the small sample size, the information found should be viewed parsimoniously when used to characterize and standardize the population of children with asthma symptoms.

The following symptoms / risk factors associated with asthma were those that showed a statistically significant ($p < 0.05$) relationship: having presented with wheezing after physical exercise; children with dry cough at night without having a cold or respiratory infection; having presented with bronchitis; children with an asthmatic mother; and, children with an asthmatic father.

Thus, it is suggested that further work be conducted, especially studies with a larger sample size, to analyze more broadly the situation of asthma in the city of Picos-PI.

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