

Prevalence of asthma and associated factors among schoolchildren in rural South India

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SUMMARY

OBJECTIVES: 1) To estimate the prevalence of asthma among secondary school children in a rural area in Karnataka, South India, and 2) to identify risk factors associated with asthma among asthma patients.

MATERIALS AND METHODS: A cross-sectional study was undertaken among 588 secondary school children in a rural area in South India. A locally adapted version of the questionnaire used in an asthma prevalence study in Iowa, USA, was administered.

RESULTS: The prevalence of asthma in the study group was 4.9%. In a multivariate model, significant association was found with sex (male predominance) and exposure to dust in the house. Place of residence, farm dwelling, household pets (cats or dogs), smokers in the family,

type of cooking fuel used and the use of firewood without chimneys did not show any significant association.

CONCLUSION: In the present study, the prevalence of questionnaire-diagnosed asthma in the study group was 4.9%. Of the total number of schoolchildren with asthma, 17 (58.6%) were detected who had not been diagnosed previously. One third of the children with asthma had visited emergency departments in the last 12 months, indicative of poor asthma control. Another third suffered limitation of activity at home and or at school, which could indicate poor quality of life.

KEY WORDS: asthma; rural schoolchildren; wheezing; prevalence

ASTHMA has become a focus of clinical research and public health programmes as a common chronic childhood disease that is under-recognised, underestimated, under-treated and responsible for considerable morbidity among children.^{1–4} Diagnosis is often missed or delayed due to the dynamic nature of the disease, unreliable past history or poor documentation of past episodes and lack of specific and sensitive diagnostic investigations.⁵ This results in inappropriate management, increased health care utilisation, high health care costs, and indirect costs such as missed school days and missed work days for care givers. Rarely, it can also lead to premature death. Few data are currently available on trends in prevalence or severity of asthma in rural India. As an estimation of the magnitude of the problem in rural India was needed, we surveyed children in secondary schools in a rural area in Madikeri (Kodagu) District, Karnataka State, South India.

MATERIALS AND METHODS

Study design and setting

The present questionnaire-based cross-sectional study was conducted in all four secondary schools in the

rural Sampaje primary health centre (PHC) area in Madikeri (Kodagu) District, Karnataka State, South India. The local district literacy rate is 82.5%⁶ and school enrolment is around 99%.⁷

Subjects and sampling

A complete enumeration of all the children studying in the four secondary schools covered by Sampaje PHC was performed. Of the 617 students enrolled in the study, 29 were absent on the day of the survey; the study population was therefore 588. The principal and the faculty of each school were explained the purpose and method of the study. After approval from the ethics committee of the KVG Medical College and Hospital and obtaining consent from school authorities, a structured questionnaire was used to estimate the prevalence of asthma and determine factors associated with it. The study was conducted during the annual school health check-up, with the help of medical interns trained for the study, during the months of July and August 2009.

Study tool

The schoolchildren were asked to fill out a structured questionnaire. This was an adapted version of the

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questionnaire used in a study conducted in Iowa, USA, to determine the prevalence of asthma in rural schoolchildren.⁸ The questionnaire had 23 items (Appendix). Two questions involved the location of the primary residence (rural vs. town) and whether the participant was currently living on a farm. Eight items were related to frequency of asthma symptoms, night time and exercise symptoms, and use of medication. The remaining questions covered asthma-related issues such as limitation of activity, risk factors, use of emergency care and frequency of rescue inhaler use. Five questions were added to the questionnaire dealing with the type of cooking fuel used at home, presence of livestock, exposure to dust at home, frequency of respiratory trouble and history of known allergies since birth. Three items on the questionnaire were used to determine whether the child had asthma: Item 3 ('Has a doctor ever told you that you have asthma?'); Item 5 ('Have you had any wheezing or whistling in the chest in the last 12 months?'); or Item 7 ('Have you used medication for the wheezing in the last 12 months?'). A child was considered to have questionnaire-diagnosed asthma if the answer to any of the above questions was 'yes'.

The questionnaire was translated into Kannada, the local language, and pilot-tested for comprehension among a group of 50 secondary school children. The children were guided through the questionnaire item by item by the medical interns trained for the study. However, special input was needed for Item 8 ('In the last 12 months, how often, on average, has your sleep been disturbed due to wheezing?') and Item 12 ('In the last 12 months, how often, on average, has your sleep been disturbed due to cough?') by about 50% of children. Necessary changes were made after pilot testing. The changes included detailed explanations (in Kannada) of difficult terms such as 'cough', 'wheeze', 'inhaler' or 'nebuliser', etc.

Statistical analysis

The data were entered using Microsoft Excel 2007 (Microsoft, Redwoods, WA, USA) and analysed using SPSS version 15.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA). The χ^2 test was applied to test the significance of association of different factors at a 5% level of significance. Odds ratios (ORs) were calculated for various factors to determine the strength of association. Independent risk factors were evaluated by binary logistic regression analysis (block entry method), the dependent variable being 'questionnaire-diagnosed asthma'.

RESULTS

Characteristics of the study population

The study included 588 schoolchildren, 57.3% boys and 42.7% girls. The mean age of the study subjects was 14.16 years (range 13–17; Table 1).

Table 1 Study population

Variable	Schoolchildren <i>n</i> (%)
Study population	588
Sex	
Male	337 (57.3)
Female	251 (42.7)
Age, years	
Range [mean]	13–17 [14.2]
13	169 (28.7)
14	206 (35)
15	170 (28.9)
16	35 (6)
17	8 (1.4)

Table 2 gives the characteristics of the study population; 98% of the children lived in rural areas, while 56.8% lived in farms; 39.3% had smoking household members, of whom an alarming 29.3% were exposed to passive smoke at home. More than half the subjects had a cat and/or a dog at home. The majority of the households ($n = 569$, 96.8%) used gas stoves for cooking, with or without other types of fuel. Most households that used firewood did not have a chimney (285/298, 95.6%).

Prevalence of asthma

Using the broadest definition of asthma (one of the three criteria: physician diagnosis, asthma-like symptoms or use of asthma medication), the prevalence of questionnaire-diagnosed asthma in the study group was 4.9% (29/588). Of the 29 children with questionnaire-diagnosed asthma, 12 (41.4%) were known asthma cases, i.e., they had already been diagnosed by a physician, 23 (79.3%) reported ever wheezing in their lifetime and 17 (58.6%) reported wheezing in the past year (newly detected). Active

Table 2 Characteristics of study population

Variable	Schoolchildren (<i>N</i> = 588) <i>n</i> (%)
Place of residence	
Rural area/village	579 (98.5)
Farm	334 (56.8)
Smoking history of household member(s)	
Present	231 (39.3)
Present and inside the house or close to children	172 (29.3)
Present but never inside the house or close to children	59 (10.0)
Absent	357 (60.7)
Household pets	
Cats	304 (51.5)
Dogs	366 (66.2)
Type of cooking fuel used at home*	
Gas	569 (96.8)
Kerosene	311 (52.9)
Firewood	298 (50.7)
With chimney	13 (4.4)
Without chimney	285 (95.6)

*Total percentage does not equal 100, as more than one type of cooking fuel is used by each household.

Table 3 Prevalence of asthma*

Variable	Schoolchildren with asthma diagnosis (n = 29) n (%)
Physician diagnosis of asthma	12 (41.4)
Wheezing or whistling (ever)	23 (79.3)
Wheezing or whistling (past year)	17 (58.6)
Active inhaler medication use	10 (34.5)

*Numbers in parentheses represent percentages out of total children with questionnaire-diagnosed asthma (n = 29).

inhaler medication use was observed in 10 children (34.5%; Table 3).

Risk factors associated with asthma

Table 4 depicts risk factors associated with asthma. With univariate and multivariate analysis, the following variables were tested for association with asthma: male sex, presence of cats at home, presence of dogs at home, family history of asthma, known allergies since birth and exposure to dust at home. Using univariate analysis, male sex, history of asthma in the family, known allergies since birth, and exposure to dust at home showed a statistically significant association. However, using multivariate analysis, a statistically significant association for questionnaire-diagnosed asthma was further demonstrable only with male sex and exposure to dust.

Severity of symptoms among questionnaire-diagnosed asthma patients

An analysis of symptom severity among asthma patients (Table 5) showed that four students (4/29, 13.8%) suffered limitations to their activities at home and the same proportion experienced limitation of sporting activities at school. One child (1/29, 3.5%) had experienced four or more asthma attacks in the past year, and eight children (8/29, 27.6%) had visited an emergency department in the past 12 months.

DISCUSSION

The prevalence of asthma in the present study was found to be 4.9% among schoolchildren. This is con-

Table 5 Severity of symptoms among asthma patients*

Variable	Asthma patients (n = 29) n (%)
Four or more asthma attacks in past year	1 (3.5)
Limitation of sporting activities at school	4 (13.8)
Limitations of activity at home	4 (13.8)
Visits to an emergency department in past 12 months	8 (27.6)

*Numbers in parentheses represent percentages out of total children with questionnaire-diagnosed asthma (n = 29).

sistent with asthma prevalence rates in other, similar studies undertaken in other countries.^{9–16} The reported prevalence of asthma among rural children from Ludhiana¹⁷ and Punjab¹⁸ was respectively 2.6% and 1%, which is lower than that estimated in the present study. However, a study from Bangalore showed 5.7% asthma prevalence in a rural population and much higher asthma prevalence in urban areas (29.5% in 1999) for the 6–15-year age group. The study also showed a consistently rising trend of asthma prevalence in urban areas.¹⁹ A study performed in Delhi showed an asthma prevalence of 11.6%.²⁰ The higher prevalence in studies conducted in urban areas such as Delhi and Bangalore could be due to allergens or urban environmental pollution precipitating the development of asthma in susceptible children. Caution needs to be exercised when comparing the results of the present study with other studies, as the tools used are not the same. Of the 29 students diagnosed with asthma (by questionnaire) in the present study, 17 students, i.e., more than 50%, were newly detected. The male-to-female ratio in our study was 1.34:1. Male predominance has also been observed in other studies.^{20–23}

The statistically significant association found between asthma and family history of asthma has also been documented in other studies. Vishwanathan et al. found a family history of asthma in 42% of asthmatic subjects (vs. only 10% of non-asthmatics).⁹ Sibbald et al. reported a prevalence of 13% in first-degree relatives of asthma patients, but only 4% in those of non-asthmatics.²⁴ We observed an asthma prevalence of 9.7% in first-degree relatives of asthmatics

Table 4 Risk factors associated with asthma

Variable	Univariate analysis		Multivariate analysis	
	P value	OR (95%CI)	P value	aOR (95%CI)
Male sex	0.019	2.99 (1.20–7.46)	0.03	2.88 (1.12–7.44)
Live on farm	0.839	1.08 (0.51–2.31)	0.52	1.32 (0.57–3.02)
Smoking history of household member(s)	0.536	0.76 (0.32–1.81)	0.40	0.68 (0.27–1.68)
Absence of chimney, irrespective of type of fuel used	0.688	0.86 (0.41–1.81)	0.95	1.02 (0.46–2.28)
Presence of cat at home	0.062	2.15 (0.96–4.81)	0.07	2.17 (0.93–5.11)
Presence of dog at home	0.422	0.74 (0.35–1.56)	0.32	0.66 (0.29–1.49)
Exposed to dust at home	0.000	5.14 (2.21–11.95)	0.01	3.63 (1.39–9.50)
History of known allergies since birth	0.002	4.06 (1.71–9.65)	0.08	2.41 (0.91–6.39)
History of asthma in the family	0.026	2.55 (1.12–5.78)	0.28	1.65 (0.67–4.09)

OR = odds ratio; CI = confidence interval; aOR = adjusted OR.

and 4.2% in non-asthmatics. In the multivariate analysis undertaken in the present study, asthma was significantly associated only with sex (with male predominance) and exposure to dust.

Similar results were found in the study performed by Pakhale et al., where factors such as male sex, family history of asthma and exposure to animals were significantly associated with asthma.²⁵ However, exposure to animals (cats and dogs) did not show any significant association in the current study. In a study by Chhabra et al., factors such as family history of asthma and wheeze during or after exercise were significantly associated with asthma.²⁰

The present study showed no significant association of asthma with place of residence, living on a farm, household member(s) smoking tobacco, or the use of firewood as cooking fuel without a chimney. These observations are in agreement with previous studies on asthma. Chhabra et al. found no significant association between the prevalence of wheeze and asthma with the type of domestic fuel used, but observed higher asthma prevalence rates in children whose household members were smokers.²⁰

Our study has demonstrated the need to achieve better asthma control to improve the quality of life of children. The poor control of asthma may be attributed to poor health care seeking, lack of access to health workers/physicians, inadequate training in diagnosing asthma, and lack of access to essential life-saving medications, among other factors. These factors are even more pertinent in rural settings.

CONCLUSION

With a prevalence of questionnaire-diagnosed asthma in schoolchildren of 4.9%, this study showed that a huge proportion of asthma cases, i.e., 58%, remained undetected. Multivariate analysis demonstrated a significant association with male sex and exposure to dust at home. A considerable proportion of asthmatic students experienced limitation of activity at home and at school, and more than a quarter had visited the emergency department within the last year, indicating poor asthma control. This study underscores the need for screening for asthma in schools for early diagnosis and better asthma management. Children and parents need to be educated about asthma symptoms and ways to keep their homes free from dust.

What this study adds to what is already known about asthma in rural schoolchildren

- 1 The prevalence of asthma among secondary school children in rural India could be higher than previous reports in other studies.
- 2 There is a need to screen schoolchildren actively for asthma for early detection and appropriate management. It is prudent to include asthma screening as part of routine school health check-ups.
- 3 The questionnaire method for diagnosing asthma may be a good tool for screening for asthma in developing countries, such as India, particularly in those areas where there is a deficiency of qualified physicians.

References

- 1 Speight A N P, Lee D A, Hey E N. Underdiagnosis and under-treatment of asthma in childhood. *BMJ* 1983; 286: 1253–1254.
- 2 Cuijpers C, Wesseling G J, Swaen G M H, Sturmans F, Wouters E F M. Asthma related symptoms and lung functions in primary schoolchildren. *J Asthma* 1994; 31: 301–312.
- 3 Siersted H C, Boldsen J, Hansen H S, Mostgaard G. Population based study of risk factors for underdiagnosis of asthma in adolescence: Odense school child study. *BMJ* 1998; 316: 651–657.
- 4 Kuhn C E, Sennhauser F H. The Yentl syndrome in childhood asthma: risk factors for under-treatment in Swiss children. *Pediatr Pulmonol* 1995; 19: 156–160.
- 5 Law K W, Ng K K, Yuen K N. Detecting asthma and bronchial hyper-responsiveness in children. *Hong Kong Med J* 2000; 6: 99–104.
- 6 Registrar General and Census Commissioner, Government of India. Census India 2011: provisional population totals. Paper 1 of 2011 India. Series 1: 93. New Delhi, India: Government of India, 2011. http://censusindia.gov.in/2011-prov-results/data_files/karnataka/7-PPT%20Paper%201%202011%20Karnataka-literacy85_98.pdf Accessed October 2011.
- 7 Sarva Shiksha Abhiyan Mission Karnataka, Ministry of Education, Government of Karnataka. Annual report 2008–09: 45. Bangalore, India: Government of Karnataka, 2009. http://ssakarnataka.gov.in/pdfs/media_doc/annualreport_08_09.pdf Accessed October 2011.
- 8 Sigurdur T S, Joel N K. School proximity to concentrated animal feeding operations and prevalence of asthma in students. *Chest* 2006; 129: 1486–1491.
- 9 Vishwanathan R, Prasad M, Thakur A K, et al. Epidemiology of asthma in an urban population: a random morbidity survey. *J Indian Med Assoc* 1966; 46: 480–483.
- 10 Ozkaragoz K, Cakin F. Atopic children in Turkey. *Ann Allergy* 1969; 27: 13–17.
- 11 Pearson R S B. Asthma in Barbados. *Clin Allergy* 1973; 3: 289–297.
- 12 Asch A J, Rabin D L, Hurwitz A, Medalie J M. Bronchial asthma in an Israeli community. *Israel J Med Sci* 1973; 9: 104–121.
- 13 Bangham C R M, Hope R A. Exercise induced asthma in Nepalese children. *Clin Allergy* 1981; 11: 273–280.
- 14 Woolcock A J, Konthen P G, Sedgwick C. Bronchial reactivity of schoolchildren in an Indonesian village. *Bull Int Union Tuberc* 1982; 57 (2): 266–273.
- 15 Woolcock A J, Dowse G K, Temple K, Stanley H, Alpers M P, Turner K J. The prevalence of asthma in the South-Fore people of Papua New Guinea: a method for field studies of bronchial hyper-reactivity. *Eur J Respir Dis* 1983; 64: 571–581.
- 16 Hsieh K H, Shen J J. Prevalence of childhood asthma in Taipei, Taiwan, and other Asian Pacific countries. *J Asthma* 1988; 25: 73–82.
- 17 Singh D, Sobti P C, Arora V, Soni R K. Epidemiological study of asthma in rural children. *Indian J Comm Med* 2002; 27: 167–170.
- 18 Singh D, Arora V, Sobti P C. Chronic/recurrent cough in rural children 33 in Ludhiana, Punjab. *Indian Pediatr* 2002; 39: 23–29.
- 19 Paramesh H. Epidemiology of asthma in India. *Indian J Pediatr* 2002; 69: 309–312.
- 20 Chhabra S K, Gupta C K, Chhabra P, Rajpal S. Prevalence of

- bronchial asthma in schoolchildren in Delhi. J Asthma 1998; 35: 291–296.
- 21 Gergen P J, Mullally D I, Evans R. National survey of prevalence of asthma among children in the United States, 1976 to 1980. Pediatrics 1988; 81: 1–17.
- 22 Milne G A. The incidence of asthma in Lower Hutt. NZ Med J 1969; 70: 27–29.
- 23 Verity C M, Van H B, Carswell F, Hughes A O. Bronchial liability and skin reactivity in siblings of asthmatic children. Arch Dis Child 1984; 59: 871–876.
- 24 Sibbald B, Horn M E C, Brain E A, Gregg I. Genetic factors in childhood asthma. Thorax 1980; 35: 671–674.
- 25 Pakhale S, Wooldrage K, Manfreda J, Anthonisen N. Prevalence of asthma symptoms in 7th and 8th grade schoolchildren in rural region in India. J Asthma 2008; 45: 117–122.

APPENDIX Childhood Asthma Questionnaire

Name: _____

Age: _____ Sex: _____ Date of birth: (day)____/(month)____/(year)_____

School address: _____

Please answer the following questions by circling the one best answer. If you are unsure about how to answer a question, please ask for help. There are no right or wrong answers.

Some questions are about problems that you may not have, but it is important for us to know that too. Please answer every question.

1. Do you live in the town or in a village?
Town
Village
2. Do you live on a farm?
Yes
No
3. Has a doctor ever told you that you have asthma?
Yes
No
4. Have you ever had any wheezing or whistling in the chest at any time in the past?
Yes
No

IF YOU ANSWERED 'NO' PLEASE SKIP TO QUESTION #10

5. Have you had any wheezing or whistling in the chest in the last 12 months?
Yes
No
6. How many attacks of wheezing have you had in the last 12 months?
None
1 to 3
4 to 12
More than 12
7. Have you used medication for the wheezing in the last 12 months?
Yes
No
8. In the last 12 months, on average, has your sleep been disturbed due to wheezing?
Never woken with wheezing
2 nights/month or less
2 nights/month or less than 1 night/week
1–3 nights per week
More than 3 nights/week
9. In the last 12 months, has your chest sounded wheezy during or after exercise?
Yes
No
10. In the last 12 months, how often were your activities affected or limited by cough or wheeze or shortness of breath while you were at home or playing with other children?
Daily
Weekly
Monthly
Less than monthly
Never
11. In the last 12 months, how often were your sporting activities at school affected or limited by cough or wheeze or shortness of breath?
Daily
Weekly
Monthly
Less than monthly
Never

12. *In the last 12 months*, how often, on average, has your sleep been disturbed due to cough?
 - Two nights per month or less
 - >2 nights/month but less than 1 night/week
 - 1–3 nights per week
 - More than 3 nights/week
13. *In the last 12 months*, have you had a cough at night apart from a cough with a cold?
 - Yes
 - No
14. *In the last 12 months*, have you had any visits to the Emergency Department or hospitalisations because of asthma, wheeze or cough?
 - Yes
 - No
15. Do you have an inhaler or nebuliser (mist machine) or any medication to use when you start to wheeze or cough, or get shortness of breath?
 - Yes
 - No
16. How often do you use the inhaler or puffer or nebuliser or any medication, on average?
 - Have them but never use them
 - A few times per month or less
 - Daily, but less than four times per day
 - Four times per day or more
17. Does anybody in your household smoke tobacco?
 - No one in the house smokes
 - One or more persons in the house smoke
 - One or more persons in the household smoke, but never inside the house or close to children
18. What is the type of cooking fuel used in your home?
 - Gas
 - Kerosene stove
 - Firewood with chimney
 - Firewood without chimney
19. Do you have any livestock at home?
 - Dog
 - Cat
 - Goat/sheep
 - Cow/buffalo
 - Other: _____
20. When you are in a dusty part of the house or with animals or near feathers (including pillows, quilts), do you ever
 - Get a feeling of tightness in your chest?
 - Yes
 - No
 - Start to feel shortness of breath?
 - Yes
 - No
21. Which of the following statements best describes your breathing
 - I never or rarely have trouble with my breathing
 - I regularly have trouble with my breathing
 - I regularly have trouble with my breathing, but it always gets completely better
 - My breathing is never quite right
22. Do you have any known allergies since birth?
 - Yes
 - No
 - If yes, to what? _____
23. Has a doctor ever told any of your family members (parents/grandparents/siblings) that they have asthma?
 - Yes
 - No

R É S U M É

OBJECTIFS : 1) Estimer la prévalence de l'asthme chez des enfants de l'enseignement secondaire dans une zone rurale à Karnataka, Inde du Sud ; et 2) identifier les facteurs de risque en association avec l'asthme chez des enfants souffrant d'asthme.

MATERIELS ET MÉTHODES : On a entrepris une étude transversale parmi 588 enfants des écoles secondaires dans une zone rurale d'Inde du Sud. On a employé une version adaptée localement du questionnaire utilisé dans l'étude de prévalence de l'asthme en Iowa, USA.

RÉSULTATS : La prévalence de l'asthme dans le groupe étudié a été de 4,9%. Utilisant l'analyse multivariée, on a trouvé une association significative avec le sexe (prédominance masculine) et l'exposition à la poussière au domicile. Le lieu de résidence, l'habitation dans une

ferme, la présence d'animaux domestiques dans le ménage (chat ou chien), la présence de membres du ménage fumant le tabac, le type de combustible utilisé pour la cuisine ainsi que les feux de bois sans cheminée, ne sont pas en association significative avec l'asthme.

CONCLUSION : Dans la présente étude, la prévalence de l'asthme diagnostiqué par questionnaire dans le groupe d'étude est de 4,9%. Parmi les élèves atteints d'asthme, 17 (58,6%) ont été détectés qui n'avaient pas été diagnostiqués antérieurement. Un tiers des enfants atteints d'asthme s'étaient rendus dans le service d'urgence au cours des 12 derniers mois, ce qui indique un contrôle médiocre de l'asthme. Un second tiers souffre de limitation d'activités au domicile et/ou à l'école, ce qui pourrait être le signe d'une médiocre qualité de vie.

R E S U M E N

OBJETIVOS: Calcular 1) la prevalencia de asma en los niños que acuden a las escuelas de educación secundaria en una zona rural de Karnataka, en el sur de la India, y 2) definir los factores de riesgo que se asocian con la presencia de asma.

MATERIALES Y MÉTODOS: Se llevó a cabo un estudio transversal con 588 niños que asisten a las escuelas secundarias en una zona rural del sur de la India. Se administró una versión adaptada localmente del cuestionario utilizado en el estudio de prevalencia de asma realizado en Iowa, Estados Unidos.

RESULTADOS: La prevalencia de asma en el grupo estudiado fue 4,9%. En el análisis multifactorial se observó una asociación significativa con el sexo (predominio masculino) y la exposición al polvo en los hogares. Factores

como el lugar de residencia, la vivienda rural, la presencia de animales domésticos (gatos o perros), el tabaquismo en miembros del hogar, el tipo de combustible usado en la cocción de alimentos y la combustión de leña sin chimenea no exhibieron ninguna asociación significativa con la presencia de asma en los niños del estudio.

CONCLUSIÓN: La prevalencia de asma en el grupo estudiado determinada mediante el cuestionario fue 4,9%. En 17 de los estudiantes (58,6%) el diagnóstico fue nuevo, pues no contaban con un diagnóstico previo. Un tercio de los niños con asma habían acudido al servicio de urgencias en los últimos 12 meses, lo cual indicó un control inadecuado de la enfermedad. Otro tercio presentaba una limitación de sus actividades en el hogar o en la escuela, que refleja un deterioro de la calidad de vida.