

## **Prevalence and factors associated with asthma among school children in rural Puducherry, India**

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### **Abstract**

**There is paucity of data on magnitude and risk factors associated with asthma in developing countries like India. The study aims to assess the prevalence and factors associated with asthma. A cross sectional study was conducted among 275 school children aged 12-15 years age group using modified International study on Allergy and Asthma in childhood (ISAAC) questionnaire in rural Puducherry. Data on various risk factors were collected. Data was analysed by univariate and multivariate analysis and expressed in proportion or percentages. The overall prevalence of bronchial asthma was found to be 8.7%. The prevalence of asthma was comparatively more in 12-13 year age group (11.4%) compared to 14-15 year age group (7.1%). Boys had a higher prevalence of asthma (10.1%) compared to girls (7.1%). Family history of bronchial asthma (OR=6.64), presence of hey in the house (OR=9.79), exercise as aggravating factor (OR=4.63) and 2<sup>nd</sup> birth order (OR=0.06) were independently associated with bronchial asthma. Asthma among school children is a public health problem in this area. Further descriptive and analytical studies will be required to describe the risk factor analysis in different geographical regions.**

**Keywords:** Asthma, Prevalence, School children, India

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### **Introduction**

Bronchial asthma among children is an important public health problem in developing countries. It will impair the child's social interaction and academic achievement [1]. Asthma creates a substantial burden on individuals and families as it is more often under-diagnosed and under-treated. According to World Health Organisation estimates, at global level 300 million people suffer from Asthma, 2,55, 000 people died of Asthma in 2005 and over 80% of Asthma deaths are reported from low and lower-middle income countries. In India, an estimated that 57,000 deaths were attributed to Asthma in 2004 and it was seen as one of the leading cause of morbidity and mortality in rural India [2].

There is limited data on epidemiology of asthma in developing countries including India. Very few community-based studies had been conducted on the prevalence of asthma in Indian children which varied from 0.9% to 15.7% in different age groups [2-7]. There is paucity of data on exposure to its various risk factors that include family history of asthma, indoor air pollution

and type of fuel used, pet animals, smoking among family members, birth order, outdoor air pollution, aggravating with exercise, allergens like hey and others. Risk factors may be different in different geographical locations and no studies had been conducted with regard to this in this area. Such studies will be useful for taking specific interventional measures at community level. So, we conducted a school based cross sectional study to determine the prevalence of asthma symptoms and its associated factors in coastal South India.

### **Material and Methods**

This cross sectional study was conducted during February to March 2012 in three schools of rural field practice area of JIPMER, Puducherry namely Deepa Oli School, Thondamanatham, Government Higher Secondary School, Thondamanatham and Government High School, Pilayarkuppam. Minimum sample size was found to be 250 subjects based on 10.2% prevalence rate, precision of 40% and non- response rate of 10%. We decided to include all the 282 students studying in 8<sup>th</sup> and 9<sup>th</sup> standard as study subjects. At first step, written permis-

sion was obtained from the principals of schools to allow the students to participate in the study. A pre tested and validated questionnaire was designed on the lines of International study on Allergy and Asthma in childhood (ISAAC) questionnaire [8]. This was translated to the local language Tamil and translated back into English to ensure reliability and validity. A pilot test was conducted before initiating the study to look for the feasibility of administration of questionnaire and accordingly minor modifications were done. After obtaining the informed consent, the designated respondent was interviewed as per the questionnaire. A child with symptom of wheezing or whistling in chest in the past 12 months was taken as criteria for defining the asthma. Other symptoms of asthma which included number of attacks of wheezing, sleep and speech disturbance, nocturnal cough were collected.

A semi-structured proforma containing information regarding the age and risk factors that include family history of asthma, type of fuel used, placement of kitchen in the house, number of windows in sleeping room, pet animals, smoking among family members, birth order, presence of factory within one kilometre of house, aggravating with exercise, allergens like hey was used to collect the data.

The collected data was entered and analyzed by using SPSS (Statistical Package for Social Sciences) version 11.0 for windows. The findings were expressed in terms of proportions or percentages. Univariate analysis was carried out for risk factors to test the differences between proportions. To determine the independent effect of various factors on bronchial asthma, multiple logistic regression analysis was performed and their significance was estimated in terms of adjusted Odds Ratio and its 95% confidence interval. P value less than 0.05 was considered as significant.

## Results

A total of 275 subjects in the age group of 12 to 15 years age group were analysed with a response rate of 97.5%. The baseline characteristics were as follows: most of the children were in the 14-15yr age group (170, 61.8%) and were males (149, 54.2%). The overall prevalence of bronchial asthma was found to be 8.7%. Out of these, 2.9% (8) had diagnosed previously with asthma. It was shown that majority (75%) had one attacks of wheezing and around half (54.2%) of them had nocturnal dry cough in the preceding week (Table 1).

**Table 1.** Distribution of symptoms of Asthma N=24

Symptoms in preceding week	Number (%)
<i>Number of attacks of wheezing</i>	
None	
One	5 (20.8)
Two	18 (75.0)
	1 (4.2)
<i>Sleep disturbance</i>	
Never	15 (62.5)
One night	9 (37.5)
More than one night	0 (0.0)
<i>Speech disturbance</i>	
Yes	4 (16.7)
No	20 (83.3)
<i>Nocturnal dry cough</i>	
Present	13 (54.2)
Absent	11 (45.8)
<i>Aggravating with exercise</i>	
Yes	
No	9 (37.5)
	15 (62.5)

**Table 2.** Prevalence of Asthma and its associated factors among school children

Associated factors	Number of subjects	Number of subjects with wheezing (%)	X <sup>2</sup> , P value
<i>Age (in years)</i>			
12 to 13	105	12 (11.4)	0.212, 1.556
14 to 15	170	12 (7.1)	
<i>Sex</i>			
Boys	149	15 (10.1)	0.733, 0.392
Girls	126	9 (7.1)	
<i>Birth Order</i>			
1	126	12 (9.5)	4.61, 0.10
2	93	11 (11.8)	
3	56	1 (1.8)	
<i>Fuel used</i>			
Firewood	4	0 (0.0)	0.42, 0.811

Prevalence and factors associated with asthma

Gas	185	16 (8.6)	
Electricity	86	8 (9.3)	
<i>Family h/o asthma</i>			
Yes	18	6 (33.3)	14.64,
No	257	18 (7.0)	<0.001*
<i>Kitchen</i>			
Inside the house	26	6 (23.0)	7.423,
Outside the house	249	18 (7.2)	0.006*
<i>Number of windows in sleeping room</i>			
1	54	4 (7.4)	
2	105	9 (8.6)	0.204,
3	116	11 (9.5)	0.903
<i>Pet animals</i>			
Yes	141	10 (7.1)	0.971,
No	134	14 (10.4)	0.324
<i>Smoking in family members</i>			
Yes	82	8 (9.8)	0.155,
No	193	16 (8.3)	0.694
<i>Smoke emitting factory within one km</i>			
Yes	88	8 (9.1)	0.021,
No	187	16 (8.6)	0.883
<i>Exercise induced</i>			
Yes	49	9 (18.4)	6.956,
No	226	15 (6.6)	0.008*
<i>Hey in house</i>			
Yes	30	10 (33.3)	25.595,
No	245	14 (5.7)	<0.001*

\*P value less than 0.05 is considered as significant

**Table 3. Determinants of Asthma: Multiple Logistic Regression analysis**

Variables	Adjusted Odds Ratio (95% Confident Interval)	P value
<i>Age (in years)</i>		
12 to 13	0.385 (0.136-1.093)	0.073
14 to 15	-	-
<i>Birth Order</i>		
1	0.137 (0.012-1.619)	0.115
2	0.06 (0.005-0.75)	0.029*
3	-	-
<i>Family h/o asthma</i>		
Yes	6.639 (1.757-25.09)	0.005*
No	-	-
<i>Kitchen</i>		
Inside the house	2.743 (0.724-10.395)	0.138
Outside the house	-	-
<i>Number of windows in sleeping room</i>		
1		
2	1.08 (0.27-4.326)	0.913
3	1.079 (0.364-3.198)	0.891
	-	-
<i>Pet animals</i>		
	0.448 (0.154-1.299)	0.139

<i>Smoking in family members</i>		
Yes		
No	0.879 (0.302-2.562)	0.813
	-	-
<i>Smoke emitting factory within one km</i>		
Yes		
No	1.678 (0.548-5.138)	0.365
	-	-
<i>Exercise induced</i>		
Yes	4.626 (1.555-13.763)	0.006*
No	-	-
<i>Hey in house</i>		
Yes	9.792 (3.196-30.002)	<0.001*
No	-	-

\*P value less than 0.05 is considered as significant

The prevalence of asthma was comparatively more in 12-13 year age group (11.4%). Boys had a higher prevalence of asthma (10.1%) compared to girls (7.1%) and the difference was not statistically significant ( $p = 0.39$ ). It was found that family history of asthma, placement of kitchen in the house, presence of hey in house and aggravating with exercise were significantly associated with asthma in children in univariate analysis (Table 2). Multiple logistic regression analysis revealed that family history of bronchial asthma (OR=6.64), presence of hey in the house (OR=9.79), exercise as aggravating factor (OR=4.63) and 2<sup>nd</sup> birth order (OR=0.06) were independently associated with bronchial asthma in the children of school going age (Table 3).

## Discussion

Various recent studies in India showed varied prevalence rates ranging from 0.9% to 15.7% [2-7]. National Family Health Survey – 3 (2005-06) showed the prevalence rate of asthma among school children of age group 15-19 years as little as 0.9% [2]. In contrast, recent study showed the prevalence of bronchial asthma among 6-15 years age group as 10.3% [3]. Prevalence of asthma and wheeze reported were 3.3% and 7.8%, respectively in a study conducted at Lucknow, in age group 13-14 years [5]. In another study from Tamil Nadu, of the 855 children studied, the overall prevalence of breathing difficulty including asthma was 18% and the prevalence of diagnosed asthma was 5% [6]. A study from Bangalore city from school children aged 6-15 years in a heavy traffic area showed prevalence of 19.34% [7]. The prevalence of ever asthma was reported as 2.4% in a population study on 73,605 individuals of all age group conducted simultaneously at four major centres in India [9]. Variation in the definition of asthma, instrument used to define it, age group taken, methodology adopted, urban-rural difference were responsible for

this varied observation. But in general prevalence rate is more in the United Kingdom, Canada, Australia, New Zealand and other developed countries ranging from 15-20% [2]. A very high prevalence of a history of wheezing was found in the three studies in Costa Rica with 46.8%, 42.9%, and 45.1% in different age groups among school children [10].

The prevalence of asthma was higher among boys similar to another study [3]. It was comparatively more among 12-13 year age group, but it was not found to be significant. A statistically significant association of bronchial asthma with family history of asthma was also observed [3]. We could not find any association with environmental tobacco exposure in contrast to another study [9]. Study has shown that interactions between genotypes at specific loci or genome regions and environmental tobacco smoke exposure with risk for development of asthma [11]. A study in Costa Rica found that very high prevalence of mite and cockroach allergens, may explain the high prevalence of asthma and asthma-related symptoms [10]. Haryana study in India found that factors associated with presence of symptoms of asthma were passive smoking, pets at home, and absence of windows in living rooms in contrast to our study [4]. This difference may be due to non-quantification of types of pets and pattern of smoking behaviour and our observation that at least one window was present in all the houses. Exercise is one of the important trigger factor for asthma similar to another study [5]. Birth order was found to be one of the several antenatal influences in asthma [2].

In conclusion, asthma among school children is a public health problem in this area. The study findings may not be generalised because of different socio demographic characteristics and associated risk factors in different

## *Prevalence and factors associated with asthma*

settings. Also, some of the risk factors like dietary influences could not be taken and diagnostic tests could not be conducted due to feasibility constraints. In spite of these limitations, the study gives valuable information on magnitude of the problem and certain risk factors, which can be utilised for preventive measures to be taken in future. Further descriptive and analytical studies will be required to describe the risk factor analysis in different geographical regions.

## **References**

1. Von Mutius E. The burden of childhood asthma. *Arch Dis Child* 2000; 82: (Suppl 2): II 2-5.
2. South Asia Network for chronic Disease, Asthma in India. Available from: [http://www.sancd.org/uploads/pdf/Asthma\\_factsheet.pdf](http://www.sancd.org/uploads/pdf/Asthma_factsheet.pdf) [Last accessed on 2012 April 19]
3. Jain A, Bhat HV, Acharya Das. Prevalence of bronchial asthma in rural Indian children: A cross sectional study from South India. *Indian J Pediatr* 2010; 77: 31-5.
4. Pokharel PK, Kabra SK, Kapoor SK, Pandey RM. Risk factors associated with bronchial asthma in school going children of rural Haryana. *Ind J Ped* 2001; 68: 103-106.
5. Awasthi S, Kalra E, Roy S, Awasthi S. Prevalence and risk factors of asthma and wheeze in school-going children in Lucknow, North India. *Indian Pediatr* 2004; 41: 1205-1210.
6. Chakravarthy S, Singh RB, Swaminathan S, Venkatesan P. Prevalence of asthma in urban and rural children in Tamil Nadu. *Natl Med J India* 2002; 15: 260-263.
7. Paramesh H. Epidemiology of asthma in India. *Indian J Pediatr* 2002; 69: 309-312.
8. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J* 1995; 8: 483-91.
9. Jindal SK. Bronchial asthma: the Indian scene. *Curr Opin Pulm med* 2007 ; 13:8-12.
10. Soto-Quiros ME, Soto-Martinez M, Hanson LA. Epidemiological studies of the very high prevalence of asthma and related symptoms among school children in Costa Rica from 1989 to 1998. *Pediatr Allergy Immunol* 2002 ;13: 342-349.
11. Kurz T, Ober C. The role of environmental tobacco smoke in genetic susceptibility to asthma. *Curr Opin Allergy Clin Immunol* 2004; 4: 335-339.

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