



Prevalence of Bronchial Asthma in Rural Indian Children: A Cross Sectional Study From EASTERN INDIA, BIHAR

DR. Rajiv Kumar

M.O ,DR,Naresh,PGT, DEPARTMENT OF PEDIATRICS,JLNMCH,BHAGALPUR

ABSTRACT

Objective: To determine the prevalence and to study the socio-demographic correlates of bronchial asthma among children aged 6-15 yr in the rural field practice area of the department of Pediatrics,JLNMCH,BHAGALPUR

Methods. This is a cross sectional community based study conducted by interviewing the parents of randomly selected 559 children in the age group of 6-15 yr using an International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire.

Results. The prevalence of bronchial asthma was found to be 10.3%. The prevalence of asthma was higher among boys (12.1%). There was a significant inverse linear trend with increasing age. A statistically significant association of bronchial asthma with family history of asthma was also observed. There was no association of bronchial asthma with socio-economic status or parents' literacy level.

Conclusion. There is a high prevalence of bronchial asthma among children with a higher prevalence among boys. There were significant inverse linear association with increasing age and also with family history of asthma

KEYWORDS : bronchial asthma,Prevalence

Pediatric asthma is a serious global health problem. It accounts for a large number of lost school days.^{1,2} Furthermore, asthma can considerably impair the child's social interaction and academic achievement.³ It can affect child's ability to enjoy and partake in activities such as playing a musical instrument and sporting events,⁴ and even affect sleep patterns and their academic and career success because of poor school attendance associated with asthma attacks.^{2,5} Childhood asthma can even lead to severe psychosocial disturbances in the family³ and also places strain on healthcare resources as a result of doctor and hospital visits and the cost of treatment.^{3,6} An estimated 1.9 disability adjusted life year (DALYs) are lost every year due to asthma among thousand children under 15 year of age in India.⁷ The increase in the prevalence of asthma in children may have serious implications for adults as 40% of children with infrequent trivial wheeze and 70-90% of those with more troublesome asthma continue to have symptoms in mid-adult life.⁸

There are very few community - based studies on the prevalence of asthma in Indian children particularly more so in rural areas. As there is paucity of data on asthma among children in India, we conducted a community based cross sectional study in rural India to determine the prevalence of asthma symptoms and its socio-demographic correlates among children of school going age (6-15 yr).

MATERIAL AND METHODS**Subjects and Sampling**

This study was carried out in the rural field practice area of the Department of Pediatrics, of Jawahar Lal Nehru medical college, College, BGP department runs seven Rural Child health services to the population. There were 1384 children in the 6-15 yr age group in the study area. Assuming the prevalence of bronchial asthma to be 10% at 95% confidence interval (C.I.) and allowing a relative precision of 20% for the estimate, the sample size was calculated for the finite population size of 1384. This meant that we needed a minimum of 532 children. Expecting a non-response rate of 5%, the final sample size of 559 was arrived at. The children were randomly selected from the study area

Questionnaire and Interview

A pre tested and validated questionnaire was designed on the lines of International study on Allergy and Asthma in childhood (ISAAC) questionnaire.⁹ This was translated to the local language Hindi and translated back into English to ensure reliability and validity. A semi-structured proforma containing information regarding the demography and socio-economic status (SES) of the individual (that was later estimated by the modified Udai-Pareek Scale¹⁰) was used to collect the data. After obtaining the informed consent, the designated respondent(s) (either of the parents/caretakers) of a child in the particular household was interviewed as per the questionnaire by the investigator (first author) himself. The investigator was guided in locating the respondents by the field Auxiliary Nurse Midwife (ANM) who was familiar with the area and population.

Data Analysis

The collected data were tabulated and analyzed by using the statistical package SPSS (Statistical Package for Social Sciences) version 10.0 for Windows. The findings were described in terms of proportions and their 95% confidence intervals. Univariate analysis was carried out separately for each factor (question). Chi square tests of significance were carried out 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. Significance was reported at 5% level.

The study was approved by the Institutional Ethics Committee of college.

RESULTS

During this study, all the required information could be collected for 555 children yielding a response rate of 99.3%. The data about the non-respondents were included only for the baseline characteristics and not during the final analysis. The baseline characteristics were as follows: most of the children were in the 6-9 yr age group (39.5%) with birth order 1 (44.5%). The sex distribution was almost equal (50.5% boys and 49.5% girls). Majority were Hindus (87.1%) and most belonged to families with low socio-economic class (63.3%) with a high literacy rate among parents (father 90.9%, mother 86.6%). The overall prevalence of bronchial asthma was found to be 10.3% (95% C.I. 7.8-12.8) among children aged 6-15 yr. Fig. 1 depicts the overall prevalence of symptoms and severity of asthma in all children surveyed

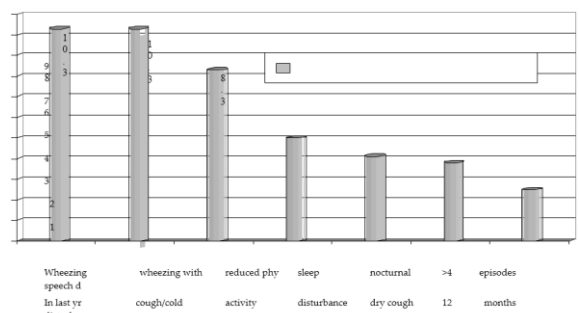


Fig. 1. Overall Prevalence of Symptoms and Severity of Asthma in all Children (n=555)

Boys had a higher prevalence of asthma (12.1%) compared to girls (8.4%) and the male to female ratio for prevalence was found to be 1.5:1. This difference though was not statistically significant ($\chi^2 = 2.067$, $df = 1$, $p = 0.151$). Majority of children surveyed had 1-3 attacks (63.2%) of asthma whereas 36.8% children had 4-12 attacks in the last 12 mo. Among males, 55.9% had 1-3 attacks and 44.1% had 4-12 attacks whereas among females, though the total frequency of attacks was less, 73.9% had only 1-3 attacks and 26.1% had 4-12 attacks of wheezing in the last one year.

The prevalence of asthma was significantly higher among younger age group (14.9% among 6-9 yr) and decreased with increasing age. It was 8.7% among 10-12 year age group and 5.5% among 13-15 yr age group. (χ^2 for linear trend=9.254, df=2, p=0.00235) (Table 1). Family history of asthma among parents had a strong association with development of asthma in children. The prevalence of asthma was almost thrice (18.8%) among children with a family history of asthma/allergy compared to that of those without a family

TABLE 1. Prevalence of Asthma According to Age Groups

Age Group (Yr)	Number of children surveyed	Number of children with asthma	Prevalence (%)	95% C.I.
6-9	221	33	14.9	10.2–19.6
10-12	172	15	8.7	4.5–12.9
13-15	162	9	5.6	2.0–9.0
Total	555	57	10.3	7.8–12.8

X2 for linear trend = 9.254 df = 2 p = 0.00235

history of asthma (6.3%). This association was found to be statistically significant (χ^2 = 20.45, df = 1, p = 0.0001) as shown in table 2.

According to socio-economic status, the prevalence of asthma was lowest in children from middle socioeconomic class (8.8%) and highest among those from high socio-economic class (27.3%). Among children belonging to low socio-economic class, the prevalence was 10.6%. This was not statistically significant. The prevalence of bronchial asthma was similar in all children irrespective of their parents' literacy status. The prevalence of asthma was highest among children whose both parents were illiterate (21.4%) whereas prevalence of asthma was similar in children who had literate father or both parents literate. This difference, however, was statistically not significant (χ^2 = 2.57, df = 3, p = 0.46).

On univariate analysis the factors found to be statistically significant were age groups showing an inverse linear trend with advancing age and family history of bronchial asthma. Multiple logistic regression analysis revealed that the age group of 6-9 yr and a history of bronchial asthma in the family were independently associated with bronchial asthma in the children of school going age (Table 3).

TABLE 2. Prevalence of Asthma According to the Family History of Asthma/Allergy

Family history of asthma allerg	Number of children surveyed	Number of children with asthma	Prevalence of asthma (%)	95% C.I.]
Present	175	33	18.9	[13.0–24.6]
Absent	380	24	6.3	[3.9–8.7]
Total	555	57	10.3	[7.8–12.8]

TABLE 3. Correlates of Current Asthma: Multiple Logistic Regression Analysis

Correlates of asthma Category	Wald	OR (Adjusted)	95% C.I.	P Value
Sex				
Female	1.00	-	-	-
Male	2.043	1.525	0.855-2.722	0.153
Age group				
13-15 yr	1.00	-	-	-
10-12 yr	1.395	1.698	0.705-4.086	0.238
6-9 yr	9.371	3.437	1.559-7.577	0.002*
Socio economic status				
High	1.00	-	-	-
Middle	0.333	0.644	0.144-2.873	0.564
Low	0.158	0.746	0.175-3.176	0.691
Family history of asthma				
Absent	1.00	-	-	-
Present	19.185	3.708	2.063-6.664	<0.001*

DISCUSSION

The prevalence of current asthma, defined as wheezing within the last twelve months, was 10.3%. The findings of this study are consistent with several other studies conducted elsewhere.^{2, 11–13} However, the

overall prevalence was 18% for symptoms suggestive of asthma and 5% for diagnosed childhood asthma among children of 0–12 yr age at Chennai 14 and 16.6% in urban and 5.7% in rural areas of Bangalore.¹⁵ Very low prevalence of asthma (2% and 2.6% respectively) has been reported in two studies in north India.^{5,16} The prevalence of frequency of more than four episodes in the past 12 mo (3.8%) in our study is similar to that in the study from Chennai.¹⁴ However, the prevalence of wheezing in past 12 mo (10.3%), speech disturbance (2.5%), nocturnal dry cough (4.1%) is less in our study population compared to the figures of 17.7%, 6.8%, 20.7% respectively at Chennai. Nevertheless the prevalence of sleep disturbance (5%) and reduced physical activity (8.3%) is higher in our study compared to that reported by Chakravarthy *et al*.¹⁴ A Turkish study had reported 4.7% wheezing in past 12 mo, 2.6% sleep disturbance and 24.4% prevalence of night cough.¹⁷

The gender distribution in our study is consistent with findings by other investigators.^{5,11,18} Some studies have noted a higher male: female ratio of 1.8:1.^{15,19} Though there was no gender difference observed in two earlier studies,^{20,21} these studies followed a different methodology and the former was carried out a long time ago. The male predominance may be related to a greater degree of bronchial lability in males.²² More recently, a female preponderance was found, which was attributed to the fact that living in ill-ventilated houses, use of cow-dung cakes and agriculture waste as fuel for

cooking and girls always helping the mothers to cook in the kitchen lead to airway inflammation and asthma.¹⁵ The inverse linear relationship between bronchial asthma and age that we report is a known phenomenon.^{17, 19, 23} Several studies have reported a strong association between family history of atopic disorders and the prevalence of current asthma as well as total wheezing.^{5,11,20,21,24} Though there is a report of no significant association between family history of asthma and asthma in children.¹⁶ However, findings of our study are concurrent with the well documented strong association of family history with prevalence of asthma in children. Regarding the association of asthma with socio-economic status of the family, several earlier studies have also shown that family income (SES) was not a significant determinant of asthma,^{11,17,21} a similar finding was observed by us. There was no significant association between literacy level of parents and prevalence of asthma in children in our study. Similarly no association between father's literacy status and asthma symptoms in children was seen in a study in Saudi Arabia.²⁵

The present study had certain limitations. Though the ISAAC questionnaire was developed for 6-7 yr and 13-14 yr old children, we administered it to collect data about children in 6–15 yr age group. There may have been respondent or reporting biases due to incorrectly reported symptoms. Lastly, spirometry or lung function tests could not be performed due to feasibility

CONCLUSION:

The present findings highlight that there is a high prevalence of bronchial asthma among school going children in rural India leading to considerable morbidity. The prevalence of asthma was higher among boys. There were significant inverse linear association with increasing age and also with family history of asthma.

REFERENCES

- Taylor WR, Newacheck PW. Impact of Childhood Asthma on Health. *Pediatrics* 1992; 90: 657–662.
- Hill RA, Standen PJ, Tattersfield AE. Asthma, wheezing, and school absence in primary schools. *Arch Dis Child* 1989; 64:246–251.
- Von Mutius E. The burden of childhood asthma. *Arch Dis Child* 2000; 82: (Suppl 2): II-2–5.
- Lenney W, Wells NEJ, O'Neill BA. The burden of pediatric asthma. *Eur Resp Rev* 1994; 4: 49–62.
- Singh D, Sobti PC, Arora V, Soni RK. Epidemiological study of Asthma in Rural Children. *Indian J Community Med* 2002; 27:167–170.
- Weiss KB, Gergen PJ, Hodgson TA. An Economic Evaluation of Asthma in the United States. *N Engl J Med* 1992; 326: 862–866.
- Deen JL, Vos T, Huttly SRA, Tulloch J. Injuries and noncommunicable diseases: emerging health problems of children in developing countries. *Bull World Health Organ* 1999; 77: 518–524.
- Oswald H, Phelan PD, Lanigan A, Hibbert M, Bowes G, Olinsky A. Outcome of childhood asthma in mid adult life. *BMJ* 1994; 309: 95–96.
- Asher MI, Keil U, Anderson HR *et al*. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J* 1995; 8: 483–491.
- Pareek U, Trivedi G. Manual of Socio-economic Status Scale (rural). Delhi: Manasayan, 1980.
- Chhabra SK, Gupta CK, Chhabra P, Rajpal S. Risk factors for development of bronchial asthma in children in Delhi. *Ann Allergy Asthma Immunol* 1999; 83: 385–390.
- Anderson HR, Bailey PA, Cooper JS, Palmer JC, West S. Morbidity and school absence caused by asthma and wheezing illness. *Arch Dis Child* 1983; 58: 777–784.

13. Somashekhar AR, Paramesh H. Prevalence of underdiagnosed asthma in adolescents. In Proceedings of the XXXIX National Conference of the Indian Academy of Paediatrics, Bangalore 2002.
14. 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.
15. Paramesh H. Epidemiology of asthma in India. *Indian J Pediatr* 2002; 69:309-312.
16. Pokharel PK, Kabra SK, Kapoor SK, Pandey RM. Risk factors associated with bronchial asthma in school going children of rural Haryana. *Indian J Pediatr* 2001; 68: 103-106.
17. Saraclar Y, Sekerel BE, Kalayci O et al. Prevalence of asthma symptoms in school children in Ankara, Turkey. *Respir Med* 1998; 92: 203-207.
18. Kumar L, Singh M. Respiratory Allergy. *Indian J Pediatr*