

## STUDY OF PREVALENCE AND RISK FACTORS OF BRONCHIAL ASTHMA IN SCHOOL CHILDREN IN URBAN AND RURAL AREAS OF KAKINADA

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### ABSTRACT

In India the prevalence of asthma has increased over the last two decades, especially in children. There is scarcity of data on prevalence of asthma in school children. The aim of the study was to estimate the prevalence of asthma in school going children aged 9-14 years in the town of Kakinada, East Godavari district, Andhra Pradesh and determine the risk factors associated with it.

### METHODS

From the listed many schools of urban and rural areas of Kakinada, 4 schools (i.e. 2 urban schools, 2 rural schools) were selected randomly. Total of 1117 students were thus selected from the four schools and the questionnaires were distributed to all of them, among them parents of 997 children responded. The questionnaire included the validated ISAAC screening questions and some other questions related to risk factors of asthma.

### RESULTS

Overall, prevalence of bronchial asthma in this study was 15%. The prevalence of asthma in urban and rural areas was 16.8% and 13.4% respectively. The prevalence of asthma in boys and girls was 17.7% and 12.6% respectively. The prevalence of bronchial asthma in age group 9-11 years was 21.1% and in age group 12-14 years was 9%. The risk factors significantly associated with asthma were family history of asthma and tobacco smoking, personal history of allergic rhinitis, atopic dermatitis.

### CONCLUSIONS

Urban areas had higher prevalence compared to rural areas. Boys (17.7%) had higher prevalence compared to girls (12.6%). Significant inverse linear association was found with increasing age as prevalence of asthma in age group 9-11 years (21.1%) was higher than 12-14 years' age group (9%).

### KEYWORDS

Asthma, Prevalence, Risk Factors.

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### INTRODUCTION

Bronchial asthma is an important health issue, especially in developing countries like India. During the childhood period, bronchial asthma is often underdiagnosed and undertreated, which may lead to severe psychosocial disturbances in the family.<sup>1</sup> In the last two decades, a significant increase in the prevalence of asthma has been reported from different parts of the world with figures ranging from 1% to 20%.<sup>2</sup> At a global level, studies have reported one year prevalence rates ranging from 4.1 to 32.1% with Australia, Brazil and Costa Rica showing the highest rates, while South East Asian countries like India, Indonesia and Malaysia had relatively low rates.<sup>3</sup> In some parts of India, the prevalence of asthma has increased very dramatically over the last two decades.<sup>4</sup> There is also a wide variation (4% to 19%) in the prevalence of asthma in

school going children reported from different geographical areas of India.

There is paucity of information on the epidemiology of asthma. Contribution of each risk factor may vary in different settings and understanding the risk factors associated with asthma such as family history, pet animals, indoor air pollution, smoking among family members and others will help in adopting appropriate preventive strategies. With this background, this cross-sectional study was conducted to assess the prevalence and associated factors of bronchial asthma among school children in town of Kakinada, East Godavari district, Andhra Pradesh, India.

### MATERIALS AND METHODS

This is a community based cross-sectional study conducted at urban and rural areas of Kakinada of East Godavari District. Both the questionnaire and parent consent form were prepared in English and the local language (Telugu) and distributed to children after explaining all the questions. Parents were requested to give consent and fill the questionnaire personally and the forms were collected back over the subsequent two days. A list of schools in urban and rural areas of Kakinada was obtained from Corporation Education Department. From the listed many schools of urban and rural areas of Kakinada, 4 schools (i.e. 2 urban schools, 2

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rural schools) were selected. After obtaining consent from school authorities and corporation education department, all children in eligible ages were invited for participation.

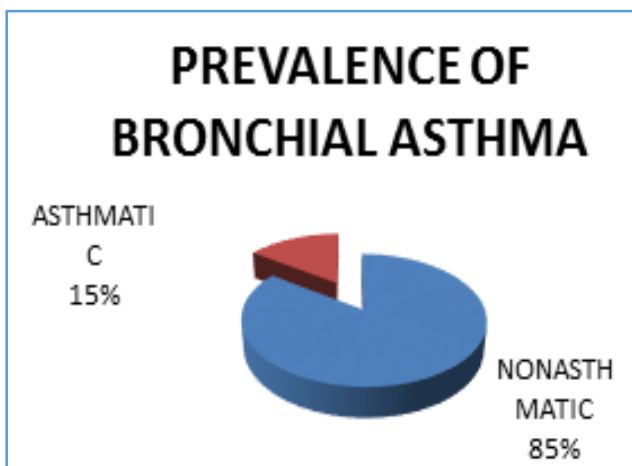
The questionnaire included the validated ISAAC screening questions and some other questions related to risk factors of asthma.<sup>5</sup> Total of 1117 students were thus selected from the four schools and the questionnaires were distributed to all of them. Among them, parents of 997 children responded. From these, 8 students were excluded based on the exclusion criterion (Children with heart disease, emphysema, kidney disorder and chronic bronchitis). Of the remaining 989 students, 500 (girls-268, boys-232) students were from urban schools and 489 students (Girls-224, boys-265) were from rural schools. The primary outcome of the study is the estimation of the prevalence of asthma. If any of the answer to the questions was "yes," the child was identified as a case of asthma. The collected data was analysed using SPSS (Statistical Package for Social Sciences) version 21 for Windows. The findings were expressed in terms of proportions or percentages. Statistical relevant tests like Chi-square were done where necessary;  $p < 0.05$  was considered significant for all statistical calculations.

**RESULTS**

In present study a total of 989 children were included, out of which 839 (85%) children without bronchial asthma and 150 (15%) children with bronchial asthma.

Number of Children Surveyed	Number of Children Without Asthma	Number of Children With Asthma	Prevalence of Asthma (%)
989	839	150	15%

*Table 1: Prevalence of Bronchial Asthma in Study Population*

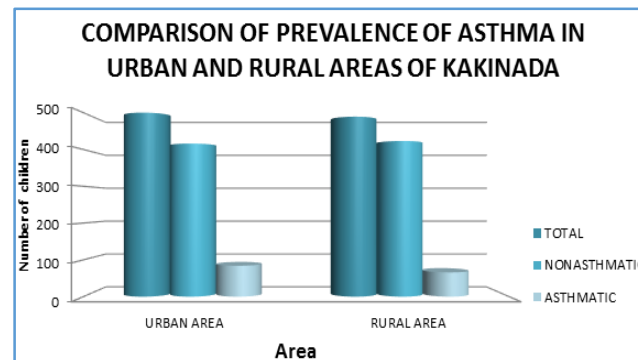


*Graph 1*

Area	Total Number of Children	Number of Non-Asthmatic Children	Number of Asthmatic Children
URBAN	500	416	84 (16.8%)
RURAL	489	423	66(13.4%)
<b>TOTAL</b>	<b>989</b>	<b>839</b>	<b>150(15%)</b>
p value			0.147

*Table 2: Prevalence of Bronchial Asthma in Urban and Rural Areas*

Out of 500 children in urban area, 84 had asthma with prevalence of 16.8%. Out of 498 children in rural areas, 66 had asthma with prevalence of 13.4%. Children in urban area had higher prevalence compared to children in rural area.

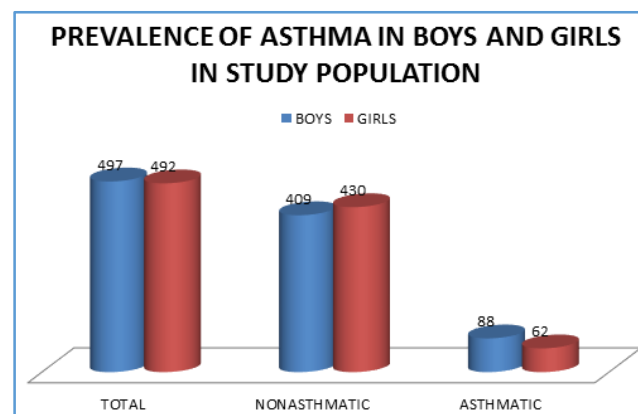


*Graph 2*

Area	Number of Non-Asthmatic Children		Number of Asthmatic Children	
	Boys	Girls	Boys	Girls
Urban	180	236	52	32
Rural	229	194	36	30
<b>Total</b>	<b>409</b>	<b>430</b>	<b>88(17.7%)</b>	<b>62(12.6%)</b>
p value	0.0252			

*Table 3: Prevalence of Bronchial Asthma in Boys and Girls in Study Population*

Out of 497 boys, 88 were found to be asthmatic with prevalence of 17.7%. Out of 492 girls, 62 were found to be asthmatic with prevalence of 12.6%. In comparison boys had higher prevalence (17.7%) than girls (12.6%). Statistical significance was found in our study with a p value of 0.0252.



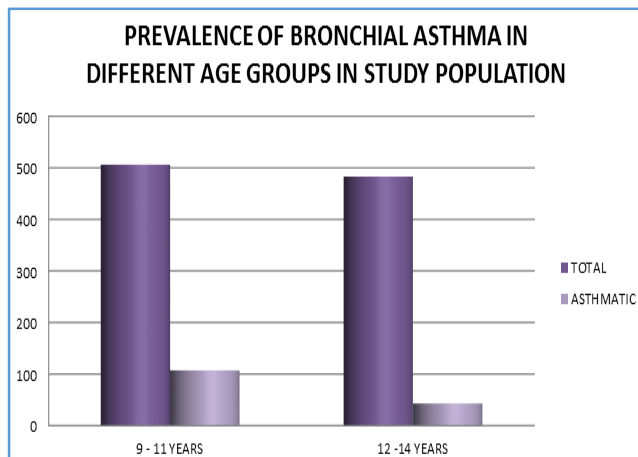
*Graph 3*

Age	Number of Children Surveyed	Number of Children with Asthma	Prevalence of Asthma (%)
9-11 years	506	107	21.1%
12-14 years	483	43	9%
<b>TOTAL</b>	<b>989</b>	<b>150</b>	<b>15%</b>
p value	0.00004		

*Table 4: Prevalence of Asthma according to Age Groups*

This study population was divided into two groups, children of 9-11 years were included in one group and children

of 12-14 years were included in another group. Table 4 shows children in age group 9-11 years (21.1%) had higher prevalence compared to 12-14 years (9%) age group. Statistical significance with p value of 0.00004.



Graph 4

**Risk Factors**

Family History of Asthma	Total No. of Children	Number of Non-Asthmatic Children	Number of Asthmatic Children (%)
PRESENT	276	179	97(35.14%)
ABSENT	713	660	53(7.4%)
<b>TOTAL</b>	<b>989</b>	<b>839</b>	<b>150</b>
p value	0.000		

**Table 5: Prevalence of Asthma according to Family History of Asthma**

Table 5 shows in comparison children with family history of asthma (35.14%) had higher prevalence than children with no family history of asthma (7.4%). There is significant association between family history of asthma and development of asthma with a p value of 0.000.

Family History of Smoking	Total No. of Children	Number of Non-Asthmatic Children	Number of Asthmatic Children
YES	379	287	92(24.2%)
NO	610	552	58(9.5%)
<b>TOTAL</b>	<b>989</b>	<b>839</b>	<b>150</b>
p value	0.001		

**Table 6: Prevalence of Asthma According to Family History of Smoking**

Table 6 shows in comparison children with family history of smoking (24.2%) had higher prevalence than children with no family history of smoking (9.5%). Significant association present with a p value of 0.001.

History of Allergic Rhinitis	Total No. of Children	Number of Non-Asthmatic Children	Number of Asthmatic Children (%)
PRESENT	49	35	14 (28.5%)
ABSENT	940	804	136 (14.4%)
<b>TOTAL</b>	<b>989</b>	<b>839</b>	<b>150</b>
p value	0.00729		

**Table 7: Prevalence of Asthma according to Personal History of Allergic Rhinitis**

Table 7 shows in comparison children with history of allergic rhinitis (28.5%) had higher prevalence than children

with no history of allergic rhinitis (14.4%). Significant association between asthma and allergic rhinitis was found with a p value (0.00729).

History of Atopic Dermatitis	Total No. of Children	Number of Non-Asthmatic Children	Number of Asthmatic Children (%)
PRESENT	111	75	36(32.4%)
ABSENT	878	764	114(12.9%)
<b>TOTAL</b>	<b>989</b>	<b>839</b>	<b>150</b>
p value	0.00001		

**Table 8: Prevalence of Asthma according to Personal History of Atopic Dermatitis**

Table 8 shows in comparison children with atopic dermatitis (32.4%) had higher prevalence of asthma than children with no history of atopic dermatitis (12.9%). Association between atopic dermatitis and asthma was significant with a p value 0.00001.

**DISCUSSION**

In this study, overall prevalence of bronchial asthma in school children was 15%. The prevalence of asthma in children aged 9-11 years was 21.1% and in children 12-14 years was 9%. In this study, the prevalence of asthma in school children aged 9-14 years in urban areas in Kakinada was found to be 16.8%. Prevalence of asthma in rural areas found in this study was 13.4%. Data from Kerala during the ISSAC study reported a prevalence of 3.7% in 6-7 years old and 4.5% in 13-14 years old and children.<sup>5</sup> A study from south Karnataka among rural children aged 6-15 years reported a prevalence of 10.3%.<sup>6</sup>

Another study from Bangalore revealed that the prevalence of asthma in children less than 18 years has increased steadily from 9% in 1979 to 29.5% in 1999.<sup>7</sup> In Tamil Nadu, data from Chennai published in 2002 showed that the prevalence of diagnosed asthma was 5% in children below 12 years of age.<sup>8</sup>

A study conducted by Matthew et al.<sup>9</sup> in Coimbatore in 2012 showed that prevalence of asthma in 11-15 years was 7.27%. A study conducted by Kumar et al.<sup>10</sup> in Pudhucherry in 2014 showed that prevalence of asthma in 12-16 years was 5.23%. Our data is comparable to those studies and has confirmed the notion that the prevalence of asthma is higher in children in south India than previously thought.

In our study prevalence of bronchial asthma in age group 9-11 years was 21.1%, whereas in 12-14 years' age group prevalence was 9%. In phase III of the ISAAC study, worldwide trends in the prevalence of asthma symptoms were done recently. In the Indian subcontinent in children aged 13-14 and 6-7 years, the prevalence increased per year by +0.02% and +0.06%, respectively.<sup>5</sup>

In Matthew et al., the prevalence of asthma among children aged 5-10 years was 9.5% and among children aged 11-15 years was 7.27%.<sup>9</sup> In Animesh Jain et al., the prevalence of asthma was significantly higher among younger age group (14.9% in 6-9 years) and decreased with increasing age.<sup>6</sup> It was 8.7% among 10-12 years' age group and 5.5% among 13-15 years' age group.

The overall male:female ratio in this study was 1.4:1. Many asthma prevalence studies done across the globe have reported a male predominance of the disease. A study conducted by R.K. Behl et al. in Shimla city reported a male-to-

female ratio of 4:1 in the age group of 6-9 years and 1.6:1 in age group of 10-13 years.<sup>11</sup> A study conducted by Animesh Jain et al. also reported male predominance.<sup>6</sup>

The exact reason for male predominance is not known, but several explanations have been offered. Male predominance may be related to a greater degree of bronchial lability.<sup>12</sup> in males. Airways in boys are also smaller.<sup>13</sup> in comparison to their lung sizes when compared to girls. Another study from the Newzealand.<sup>14</sup> showed higher rates of sensitivity to indoor allergens among males aged 13 years than their female counterparts as assessed by the skin prick test.

It was observed in our study that prevalence is significantly more among those with a family history of bronchial asthma similar to other studies.<sup>6,11</sup> Exposure to passive tobacco smoke was shown to be an important risk factor in our study and various other studies.<sup>10,11</sup> Exposure to passive smoke has a number of severe effects on control and severity. Therefore, smoking cessation by parents or relatives would benefit their child's health status. This study revealed that presence of one or other allergic disorders are significantly associated with asthma.<sup>15,16</sup> Increased allergen exposure in genetically susceptible individuals can lead to allergic sensitization. Continued allergen exposure can increase the risk of asthma.

### CONCLUSIONS

Bronchial asthma is a significant health problem among children in Kakinada with overall prevalence of 15%. Urban areas had higher prevalence compared to rural areas. Boys had higher prevalence compared to girls. Significant inverse linear association was found with increasing age as prevalence of bronchial asthma in age group 9-11 years was higher than 12-14 years' age group. Exposure to tobacco was a significant risk factor to childhood asthma. A positive family history of asthma and the presence of one or more type of other allergic disease in the child were significantly associated risk factors for asthma development.

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