International Journal of Medical Science and Clinical Inventions 4(2): 2642-2645, 2017
DOI:10.18535/ijmsci/ v4i2.02 **ICV 2015: 52.82**
e-ISSN: 2348-991X , p-ISSN: 2454-9576

Review Article

Prevalence of Bronchial Asthma among School Children in Urban and Rural Areas and Associated Risk Factors: A Cross Sectional Study from Western Uttar Pradesh, India

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ABSTRACT:

Objective: To find the prevalence of asthma in the age group of 6 –13 years & to identify the risk factors increasing the prevalence of asthma in Urban and Rural area school children in Western Uttar Pradesh.

Methods. This is a cross sectional community based study conducted by interviewing the parents of randomly selected 1287 children in the age group of 6-13 years using a modified International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire.

Results: Out of 1287 children, 746 children belong to urban area and 541 children were in rural area. Prevalence of bronchial asthma in Urban School children was 11.93% and 9.79% for Rural Children respectively. The prevalence of asthma was higher among girls (11.96%) compared to boys (10.32%). There was an inverse linear trend with increasing age. A statistically significant association of bronchial asthma with breast feeding, type of diet, indoor plants, family history of asthma, allergy, type of domestic fuel used and heavy vehicle smoke was observed. There was no association of bronchial asthma with age, gender, birth weight and family history of smoking.

Conclusion: There is a high prevalence of bronchial asthma among children living in urban areas with a high prevalence among girls. Advice for exclusive breast feeding, avoidance of domestic fuel smoke and heavy vehicle smoke may reduce the risk of asthma and should be encouraged.

Key words: Bronchial asthma; Global initiative for asthma; Children; ISAAC questionnaire; Prevalence.

INTRODUCTION:

Asthma has been recognized as one of the most common chronic disease in the world with an estimated 300 million people currently suffering with the disease and an increasing morbidity and mortality coupled with health care burden from asthma lately. It affects 1-18 % of the general population in different countries[1]. It is a common illness of childhood presenting with visit to health facility, admissions, missed school days and limitation of activity[2]. The number of disability-adjusted life years (DALYs) lost due to asthma worldwide has been estimated to be currently about 15 million per year. Worldwide, asthma accounts for around 1% of all DALYs lost, which reflects the high prevalence and severity of asthma. The number of DALYs lost due to asthma is similar to that for diabetes, cirrhosis of the liver, or schizophrenia.[3]

Since a few epidemiological studies have been carried out in our country to study the prevalence of asthma among children and to identify the risk factors associated with it moreover there are few studies in Uttar Pradesh, this study was conducted to assess the prevalence and risk factors of childhood asthma in Meerut City, India.

MATERIAL AND METHODS:

Subjects and Sampling:

This study was a community based cross sectional study carried out in district Meerut from July 2015 to March 2016. School children aged 6-13 years were eligible for the study.

There were 1536 children in the 6-13 years age group in both urban and rural areas. Assuming the prevalence of bronchial asthma to be 10% at 90% confidence level and an absolute error of 2.0%, the sample size of the study was calculated to be 864 using the formula. This meant that we needed a minimum of 864 children. Expecting a non-response rate of 10%, the final sample size of 1287 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[4]. This was translated to the local language (Hindi) and translated back into English to ensure reliability and validity. After obtaining consent from school authorities and parents/guardians the questionnaires were distributed in different section of classes. Age of children was confirmed from school records. The childrens were asked to get the questionnaire completed by their parents/Guardians. Some questions were adjusted as the parents/Guardians initially misunderstood them. Later, questionnaires were collected from children.

After recording the responses, relevant physical examination and systemic examination were done by interviewer. Peak expiratory flow rate (PEFR) was measured in standing position with Wrights mini peak flow meter after the demonstration. Highest of the three readings was taken as true value.

Incompletely filled questionnaires and subjects not cooperating (n = 249) were excluded in the final analysis.

Data Analysis:

The collected data were tabulated and analyzed by using the statistical package SPSS (Statistical Package for Social Sciences) version 16.0 for Windows. Chi square tests of significance were carried out to test the differences between proportions. Association between variables was considered statistically significant if p-value was < 0.05.

The study was approved by the Institutional Ethics Committee of Subharti Medical College, Meerut.

RESULTS:

During this study, all the required information could be collected for 1287 children yielding a response rate of 83.8%. Out of 1287 children, 746 children were in urban area while 541 children were in rural area. The study included 727 (56.5%) boys and 560 (43.5%) girls. The Highest numbers of children were in 6-9 years age group (n=794, 61.7%). Majority of subjects were Hindus (n=1007, 78.2%). The demographic profile and risk factors of asthma of baseline population of school children are given in Table 1.

On the basis of ISAAC questionnaire, 142 (11.03%) children were found to be the case of bronchial asthma. Out of 142 children, 89 were in urban area and rest 53 children were in rural area giving prevalence rate of 11.93% and 9.79% respectively. Out of the total 560 females, 67 (11.96%) were positive for asthma while among 727 males, 75 (10.32%) were positive for asthma. In the 6-9 years age group, out of the 88 asthmatic children, 42 were males and 46 were females. In the age group of 10-13 years there were 54 cases (33 males and 21 females). Age and sex were not significantly associated with asthma (p>0.05). Maximum numbers of positive cases were found in the age of 6 - 9 years, 62.0 % of the total 142 positives cases. Out of the total 1287 children studied, 494 (38.4%) were exposed to passive smoking, out of which 71 (14.3%) were found to have asthma. In the remaining 793 (61.6%) children who were not exposed to tobacco smoke, 8.9% were found to have asthma. However, the association between passive smoking and asthma was not significant (p>0.05).

There were 160 students with a positive family history of asthma, out of which 47 (29.3%) had asthma. Out of the 1127 students who did not have a family history of asthma, 95 (8.4%) were found to be positive for asthma (p<0.0001). When results were analysed for other allergic disorders, out of the total 1287 children, 147 suffered from other allergic manifestations; 76 (51.7%) of these were found to have asthma. Of the remaining 1140 children without any other allergic manifestations, 66 (5.8%) had asthma (p<0.0001). The association with cooking fuel was not found to be significant in our study; 78.2% households were using liquefied petroleum gas (LPG) as the main cooking fuel. Although the percentage of asthma cases in the subjects using coal as a fuel was high, the association cannot be considered significant.

Prevalence of asthma was significantly higher in children with no history of breastfeeding (20.6%), indoor plant at home (30.0%), non vegetarian by diet (15.6%) and heavy vehicle smoke (16.9%).

Table 1: Demography and risk factors

	Predictors	n (%)	Asthmatic	Nonasthmatic	P value
1	Gender	1287 (100)			0.350
	Boys	727 (56.5)	75	652	
	Girls	560 (43.5)	67	493	
2	Age (Years)				0.942
	6-9 years	794 (61.7)	88	706	
	10-13 years	494 (38.3)	54	439	
3	Religion				0.002
	Hindu	1007 (78.2)	113	894	
	Muslims	256 (19.9)	21	235	
	Sikh	20 (1.6)	7	13	
	Jain	4 (0.3)	1	3	
4	Family History of Shortness of breath				<0.001
	Present	160 (12.4)	47	113	
	Absent	1127 (87.6)	95	1032	
5	Personal History of allergy				<0.001

	Nasal	96 (7.5)	59	37	
	Skin	40 (3.1)	6	34	
	Both	11 (0.9)	11	0	
	No	1140 (88.6)	66	1074	
6	Type of domestic fuel use				0.116
	Biomass	78 (6.1)	15	63	
	Biomass/Gas	127 (9.9)	13	114	
	Electricity/Gas	22 (1.7)	3	19	
	Gas	1060 (82.4)	111	949	
7	Passive smoking				0.061
	Present	494 (38.4)	71	423	
	Absent	793 (61.6))	71	722	
8	Birth weight				0.071
	Low birth weight	517 (40.2)	67	450	
	Normal Birth weight	770 (59.8)	75	695	
9	History of breast feeding				0.013
	Present	1224 (95.1)	129	1095	
	Absent	63 (4.9)	13	50	
10	Indoor Plant at home				0.001
	Present	70 (5.4))	21	49	
	Absent	1217 (94.6)	121	1096	
11	Type of diet				0.03
	Veg	1107 (86)	114	993	
	Nonveg	180 (14)	28	152	

DISCUSSION:

In the present study, the prevalence of asthma in Meerut city was found to be 11.03 percent. The findings of this study are consistent with several other studies conducted elsewhere[5-8]. However, Zaman et al[9] reported a much higher prevalence rate of 16.1% amongst Bangladeshi school children. Similar higher prevalence rate was reported by Paramesh[10] who showed a prevalence of 29.5% in 1999 in Bangalore city. This high prevalence rate may be explained by different levels of air pollution, exposure to allergen, climatic condition, increase in the number of industries, density of population and the number of automobiles. Increased temperature and carbon dioxide (CO2) production due to climatic change will result in increased production of pollens and fungal spores that could exacerbate the symptoms of allergic disease[11-12]. Low prevalence of asthma was also reported by many other authers[13-16].

Many asthma prevalence studies done across the globe have reported a male predominance of the disease but in our study we found female predominance. The overall female: male ratio in our study was 1.3:1. This was supported by Paramesh[10] who found female to male ratio of 1: 0.7. The exact reason for female predominance is not known but several explanations have been offered. Girls were involved in helping mothers cook in kitchen of ill-ventilated houses where cow dung cakes and agricultural waste was used as cooking fuel which led to airway inflammation and asthma.

In the present study, a strong association between the presence

of family history of asthma and the prevalence of asthma was observed. Sibbald et al[18] showed that when both parents had asthma, 80% children developed the disease, compared to 40% of children when one parent had asthma and when no parent had asthma, only 10% children developed asthma. Maternal influence[19] is probably more than paternal influence, particularly in children less than five years of age possibly due to trans-placental transfer of allergens or cytokines to the fetus.

In our study we found significant association between asthma prevalence and use of LPG or kerosene as fuel. Though, there was significant association with the use of coal, due to the very small number, it cannot be regarded as risk factor for the occurrence of asthma. Exposure to smoking and prevalence of asthma is a subject of conflicting evidence in the literature. Though several studies have reported a significant association of asthma and smoking, our study did not show the significant association between smoking and asthma ($p>0.05$). It is possible that due to stigma, many children and parents did not report smoking.

In the present study, of the 147 (11.4%) children who suffered from other allergic manifestations, such as eczema, urticaria, rhinitis etc, 76 (53.5%) had asthma; suggesting a strong possibility of children suffering from other allergic manifestations to develop asthma.

The limitation of our study is that it is a school‐based cross‐sectional study. Therefore, true prevalence and direct causal relationship with risk factors cannot be implied.

Conclusion: There is a high prevalence of bronchial asthma among children living in urban areas with a high prevalence among girls. Prevalence was high among families who use fuel for cooking such as coal fires, Cow dung, Oil stoves and fire wood etc. There was increased prevalence of asthma with positive family history of asthma ($P<0.001$) and in family with history of smokers. Advice for exclusive breast feeding, avoidance of domestic fuel smoke and heavy vehicle smoke may reduce the risk of asthma and should be encouraged.

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