Risk Factors Associated with Bronchial Asthma in School Going Children of Rural Haryana

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Abstract. Bronchial asthma is one of the most common illnesses in children. Factors influencing development of asthma have not been studied in rural population. 2000 school going children from five schools of Chhainsa and Dayalpur Primary Health Centre area in Ballabgarh Block of Haryana state were screened for presence of symptoms of asthma using a questionnaire suggested by International Study of Asthma and Allergy in Children (ISSAC). 40 children were identified as cases of bronchial asthma. For each child with asthma two age and sex matched non-asthmatic controls were selected from the study population. History, clinical examination and in-depth interview were carried out for all cases and controls. Factors associated with presence of symptoms of asthma on multivariate analysis were passive smoking (OR 3.33, 95% CI 1.85-7.65), pets at home (OR 5.5, 95% CI 1.04-29.15), and absence of windows in living rooms (OR 4.03, 95% CI 1.17-13.79). Factors such as family history of asthma, history of worm infestation, fuel used for cooking, location of kitchen and food allergy were not significant on statistical analysis. Thus, passive smoking, inadequate ventilation and pets (dogs and cats) at home are significant risk factors associated with presence of symptoms of asthma in rural children.

Key words: Asthma; Risk factors; Passive smoking; Pets; Cross ventilation; Childhood asthma

Asthma is a chronic inflammatory disorder. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness and tightness in chest. These episodes are associated with airway narrowing resulting into obstruction to air-flow. The obstruction is reversible spontaneously or by medications.1 An increased prevalence and severity of asthma has been reported worldwide.2 Indian studies are limited regarding asthma in children. Recent report shows wide variation (4-19%) in the prevalence of asthma in school going children from different geographic areas in India.3 The variation in the presence of different risk factors responsible for development of asthma such as passive smoking, allergen derived from pets, poor ventilation, family history of asthma, biomass used in the kitchen and allergy to particular food has been studied by various workers. Scanty information on this aspect of asthma from rural India prompted us to carry out the present study.

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MATERIALS AND METHODS

A cross-sectional survey was carried out from July 1995 to August 1996 in Dayalpur and Chhainsa Primary Health Centres in Ballabgarh block of Haryana. Ballabgarh is located about 37 kms South West of Delhi. Primary Health Centres, Dayalpur and Chhainsa are situated 11 kms and 19 kms respectively away from Ballabgarh. These villages are representative of rural life in the state of Haryana. A screening questionnaire adopted from International Study of Asthma and Allergy in Childhood (ISSAC) was used to find out children with symptoms of asthma. The questionnaire was first tested on a sample of 20 children after translation in Hindi language. Minor modifications in the language were done before the final survey. To see the content of field used version the questionnaire was re-translated into English and expert's opinion was taken for validity and reproducibility of questionnaire for field use. The questionnaire included 5 questions with a possible answer of either yes or no (Table 1). The questionnaire was administered to
TABLE 1. Screening Questionnaire

1. Did you ever have wheezing or whistling in the past?
2. Did you have wheezing or whistling in the chest in last 12 months?
3. Have you ever been diagnosed to have asthma?
4. In the last 12 months your chest ever sounded wheezy during or after exercise?
5. In the last 12 months have you had persistent dry cough at night without any cold or chest infection?

children in the school after explaining each question. For students who were part of the class but absent on the day of administration of questionnaire it was administered on the next day. If answer to any of the given questions was yes, the child was identified as a case of bronchial asthma. For each child with asthma two age and sex matched controls were selected from the study population for identification of risk factors associated with development of asthma. The criteria applied for selection of controls were as follows: free from bronchial asthma, matched for sex and age ± 3 months according to record in school. Children chest deformities due to congenital anomalies or known congenital heart disease and history of pulmonary tuberculosis and rheumatic heart disease were not enrolled as controls.

A detailed interview to elicit the association of risk factors was carried out on cases and controls. The questions included in the interview were family history of asthma, presence of pets (cats and dogs) at home, passive smoking which was defined as any form of tobacco smoking by family members in the living room, ventilation in the living room; which was assessed by asking about the presence of windows in the rooms, cooking media, history of passing worms, location of kitchen and food allergy.

The sample size was calculated using the formula for matched case control study. For a minimum prevalence 5% and odds ratio of 3 for a risk factor, power of 90%, α error of 5% in a matched case control design when 2 controls are taken, for each case a sample size of 40 cases and 80 controls was calculated. Data analysis was done using the "Dbase" and Epinfo 5 computer software packages. Yate's corrected Chi-square test was used to get the p-value, odds ratio was calculated by cornfield method. To take care between the risk factors a multivariate analysis was done using the "BMDP" statistical software package (BMDP Statistical Software Inc, 1440 Sepulveda Boulevard, Los Angeles CA 90025).

RESULTS

The baseline data including mean age, sex, height and weight were comparable between cases and controls as shown in Table 2. Forty cases and 80 controls were studied. 27 cases and 54 controls were males and 13 cases and 26 controls were girls.

Table 3 shows the factors found to be significantly associated with asthma. These were passive smoking, presence of pets at home, and absence of windows in living room. The other factors which were not statistically significant in this study were family history of asthma, worm infestation, fuel used for cooking, location of kitchen, and food allergy.

DISCUSSION

The study was carried out in Government schools because of more chances of generalizability and secondly a school health program was existing in these schools. Hence there was good rapport with teachers and students of these schools. The age group selected was between 11-15 years for greater reliability as the information on risk factors was obtained from children themselves.

In the present study passive smoking was observed to be a significant risk factor associated with presence of asthma symptoms with an odds ratio of 3.3. Passive smoking has been found to increase the risk of developing asthma in children by various workers. Wright in his study concluded that passive exposure to cigarettes is associated with lower respiratory infections in infants, particularly when the amount of maternal smoking is a pack or more per day and when day care is not used. Heavy maternal smoking is also associated with higher rates of both wheezing and non-wheezing type of lower respiratory tract infections in children. Where in his study of six cities in USA, observed a consistent association between parental cigarette smoking and increased respiratory illness during childhood.

In the present study pets were present 5.5 times more in homes of asthmatic children as compared to normal children. Cats and dogs are associated with increased asthma morbidity. Cats are the most allergic pets. Since widespread exposure to cat and dog allergens occurs in the community, the exposure is not limited to pet owners only. Besides these, danders of horse,

Table 2. Base Line Data of Cases and Controls

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Cases</th>
<th>Controls</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>12.4 (1.39)</td>
<td>12.4 (1.39)</td>
<td>0.89</td>
</tr>
<tr>
<td>Mean height (cm)</td>
<td>138.7 (10.72)</td>
<td>137 (17.29)</td>
<td>0.64</td>
</tr>
<tr>
<td>Mean weight (kg)</td>
<td>35.5 (8.65)</td>
<td>38.2 (8.65)</td>
<td>0.17</td>
</tr>
</tbody>
</table>

(Figures in brackets are standard deviations from the mean).