

## Asthma symptomatics school children of Sonapur

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### Abstract

**Background:** Bronchial asthma is one of the most common illnesses in children. Factors influencing development of asthma have not been studied in rural population.

**Materials and methods:** Two thousand school-going children from three schools of Sonapur VDC, Sunsari in the surrounding of industries were screened for the presence of symptoms of asthma using a questionnaire suggested by International Study of Asthma and Allergy in Children (ISSAC).

**Results:** One hundred twenty children were identified with symptoms of bronchial asthma. For each child with asthma two age and sex matched non-asthmatic control 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 in statistical analysis.

**Conclusion:** Thus, passive smoking, inadequate ventilation and domestic animals and pets (dogs and cats) at home are significant risk factors associated with presence of symptoms of asthma in these children.

**Key words:** asthma; risk factors; passive smoking; domestic animals and 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.<sup>1</sup> An increased prevalence and severity of asthma has been reported worldwide.<sup>2</sup>

Nepali studies are very less limited to hospital based report regarding asthma in children. Report from neighboring country India shows wide variation (4-19%) in the prevalence of asthma in school-going children from different geographic areas.<sup>3</sup>

The variation in the presence of different risk factors responsible for development of asthma such as passive smoking, allergen derived from domestic animals and pets, poor ventilation, family history of asthma, biomass used in the kitchen and allergy to particular food has been studied by various workers. The growing industrialization with many job opportunities, villagers are able to generate income in cash, but the scanty information on this aspect of asthma from rural Nepal prompted us to carry out the present study in the region.

### Materials and Method

A cross-sectional survey was carried out from September 2005 – 2006 in the school located nearest various industries at Sonapur VDC of Sunsari. These villages are representative of rural life near industrial hubs of Nepal.

A screening questionnaire adopted from International Study of Asthma and Allergy in Childhood (ISSAC) was used to find out children with symptoms of asthma, which is validated and adopted by many investigators worldwide to study the approximate burden of this disease.

The questionnaire was tested on a sample of fifty children after translating in Nepali 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 five questions with a possibility of either yes or no (Table 1).

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**Table 1:** Asthma and Screening questionnaire from ISSAC

<ol style="list-style-type: none"> <li>1. Did you ever have wheezing or whistling in the past?</li> <li>2. Did you have wheezing or whistling in the chest in last 12 months?</li> <li>3. Have you ever been diagnosed to have asthma?</li> <li>4. In the last 12 months your chest ever sounded wheezy during or after exercise?</li> <li>5. In the last 23 months have you ever had persistent dry cough at night without any cold or chest infection?</li> </ol>
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The questionnaire was administered to 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 probable 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 the selection of controls were as follows: free from bronchial asthma, matched for sex and age  $\pm 3$  months according to record in school. Children's chest deformities due to congenital health diseases 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 animals 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.<sup>4</sup> For a minimum prevalence of 5% and odds ratio of 3 for a risk factor, power of 90%,  $\alpha$  error of 5% in a matched case control design when 2 controls are taken, for each case a sample size of 120 cases and 240 controls was calculated. Data analysis was done using the "Dbase" and Epiinfo 5 computer software packages. Yate's corrected Chi-square test was used to get the p-value, odds ratio was calculated by Cornified 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. 120 cases and 240 controls were studied. 81 cases and 162 controls were males and 39 cases and 78 controls were females.

Table 3 shows the factors found to be significantly associated with asthma. These were passive smoking, presence of pets at home and the 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.

**Table 2:** Baseline Data of Cases and Controls

Characteristics	Cases n = 120	Controls n = 240	p value
Mean age (years)	12.4 (1.39)	12.4 (1.39)	0.89
Mean height (cm)	138.7 (10.72)	137 (17.29)	0.64
Mean weight (kg)	35.5 (8.65)	38.2 (8.65)	0.17
(Figures in brackets are standard deviation from the mean.)			

**Table3:** Comparison of Cases and Controls for associated risk factors

Factors	Cases n=120	Controls n= 240	Odds ratio	p value
Passive smoking	81	105	3.33 (1.85-7.65)	0.004
Pets and domestic animals	15	27	5.5 (1.04-29.15)	0.045
Absence of windows in rooms	21	12	4.03 (1.17-13.79)	0.041
Family history of asthma	15	9	3 (0.63-14.36)	0.17
Worms (round worm)	0	3	NA	
Fuel used (biomass)	107	222	3.16 (0.475-24.7)	0.27
Kitchen in the living room	3	0	NA	
Food allergy	9	6	3.16 (0.6-15.5)	0.19
(Figures in parenthesis are confidence intervals)				
NA (Not Applicable for calculation of odds ratio)				

### Discussion

The study was carried out in the Government school 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 significant risk factor associated with presence of asthma symptoms with an odds ratio of 3:3. Passive smoking has found to increase the risk of developing asthma in children by various workers.<sup>5</sup> Wright in his study concluded that passive exposure to cigarettes is associated with 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.<sup>6</sup> Heavy maternal smoking is also associated with higher rates of both wheezing and non-wheezing type of lower respiratory tract infections in children. Were<sup>7</sup> 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 domestic animals were 5.5 times more in homes of asthmatic children as compared to normal children. Cats and dogs are associated with increased asthma morbidity.<sup>8</sup> Cats and dogs are associated with allergenic pets.<sup>9</sup> Since widespread exposure to cat and dog allergens occur in the community, the exposure is not limited to pet owners only. Besides these, danders of horse, cattle and sheep wool, feathers from chicken, and ducks also sensitize people and increase asthma morbidity.<sup>10</sup>

Absence of windows in living rooms was judged as a significant factor associated with asthma in the present study. Inadequate ventilation in home may result into increased dampness and cross infection. That may increase the respiratory diseases.

Children living in such environment are associated with increased viral infections and asthma morbidity.<sup>11</sup>

Factors including family history of asthma, worm infestation, and kitchen in living room, food allergy and use of biomass as cooking media were not statistically significant. However, present study had a sufficient potentiality to study only those factors that had prevalence of 10% in controls and an odds ratio of 3. Hence there was no sufficient power to study association of family history, worm infestation, kitchen in living room and food allergy. In the present study, no significant association between positive family history and asthma could be established. Gerrard in their study concluded that allergic diseases more specifically nasal, bronchial and coetaneous tend to run in families.<sup>12</sup> In another large study by Lub on 7000 Swedish twin pairs documented higher prevalence of asthma, hay fever and eczema in homozygous and dizygous twin pairs<sup>13</sup>.

The literature suggests that parasite infestation may be associated with increased respiratory morbidity i.e. Loffler's syndrome and may be confused with bronchial asthma. In the present study, history of passing round worms was obtained in only three children in control group. Hence no meaningful conclusion can be drawn from this data.

Acute illness resulting from exposure to high concentration of indoor pollutants is well recognized clinical entity.<sup>14</sup> Location of kitchen outside or inside the sleeping room was studied as a risk factor. In all cases and controls kitchen was located outside the living rooms except in one where cooking was done in the living room. Therefore, this factor could not be analyzed.

History of food allergy was present only in 9 out of 120 cases and 6 out of 240 controls and was not significant to statistical analysis. Food allergy is a known factor to provoke asthma attack Foods more

commonly associated with asthma are fish, shellfish, peanuts, other nuts, tomatoes, wheat, eggs, soya and chocolate. There is a need of more food specific control trial to find out allergens related to food to individuals, which was beyond the scope of this study.

We observed higher prevalence of symptoms of asthma among school children in this VDC than adjacent area, where similar studies were done.<sup>15</sup> The report is alarming as there are various industries of different nature of product. We need to plan the study to find out any product to trace the reason causing higher rate of asthmatic symptoms in school children of the region.

We concluded that passive smoking, inadequate ventilation and domestic animals at home are significant risk factors associated with presence of symptoms of asthma in rural children.

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