Assessment of Impact of Environmental Causative Factors on Severity of Asthma in Children

Sharad Karki, Rajesh Kumar Suman, Ipseeta Ray Mohanty, NC Mohanty, YA Deshmukh

ABSTRACT

Objective: The present study evaluated the association between environmental factors and severity of asthma in children.

Materials and methods: Questionnaires were specifically designed factoring patients’ demographical profile, socioeconomic status, causative environmental factors and severity of asthma.

Results: A total of 100 patients were interviewed who visited our pediatric department complaining of asthma symptoms. Maximum children were of the age group between 6 and 10 years (29%). The ratio of male (64%) was more than female (36%). Maximum patients belong to middle class family (33%) and lower middle class (29%). Among children cold/respiratory illness (87%) followed by exercise and sports (70%) was the most common environmental trigger for asthma. Asthma symptoms worsened during day time and winter season in this group.

Conclusion: A significant positive association between environmental asthma triggers: smoke (p = 0.035), strong smell (p = 0.008), cold/respiratory illness (p = 0.035), hot/cold air (p = 0.03) and severity of asthma in children was observed. Winter season worsened the asthma symptoms (p = 0.047) in children.

Keywords: Socioeconomic status, Bronchial asthma, Environmental factor, Severity of asthma.

Area of research: Public health research and pharmacology.

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INTRODUCTION

Asthma is a chronic inflammatory disorder of airways characterized by an obstruction to airflow which completely or partially reversed with or without specific therapy. Airway inflammation is the result of interaction between various cells, cellular elements and cytokines. In susceptible individuals, airway inflammation may cause recurrent and persistent bronchospasm which causes symptoms that include wheezing, breathlessness, chest tightness and cough particularly at night, early morning or after exercise. There has been a noticeable increase in the healthcare burden due to asthma globally. The prevalence and mortality from asthma have shown an upward trend during an era when quality medications are easily available for asthma.

Bronchial asthma is a recurrent but reversible obstruction of the airways. Epidemiological studies carried out in different countries indicate the prevalence of asthma is in the range of 3.5 to 20% of the population in any country. The documented increase in asthma prevalence over the last 25 years is likely due to changes in our environment or lifestyle because changes in our genetic makeup would take more than several generations to occur. Worldwide, asthma cases are increasing at a rate of 50% every decade, and according to the World Health Organization, by the year 2020, asthma, along with chronic obstructive pulmonary disease (COPD) will become the third leading cause of death. An estimated 300 million people in the world currently have asthma and there may be an additional 100 million persons with asthma by 2025. It has been reported that India has approximately 15 to 20 million asthmatics and 10 to 15% of Indian children between the ages of 5 and 11 years show symptoms of asthma. In India, there is a median prevalence of about 2.4% in adults of over 15 years of age. In one of the largest epidemiological multicentric studies on the prevalence of asthma in Indian adults using a uniform, validated and standardized methodology, a prevalence of 1.69 to 3.47% was observed. Female gender, increasing age, family history of asthma, history suggestive of atopy, lower socioeconomic status and urban residence were significantly associated with asthma. In a study in Mumbai, the prevalence of asthma in adults was 3.5 and 17% when broad definitions including asymptomatic bronchial hyper responsiveness were used. In rural children in Delhi, parental smoking, paracetamol intake, current exposure to cat, exposure to traffic pollution were found to be significantly associated...
with current wheezing.\textsuperscript{9} Whereas in children aged 4 to 20, 15 years in Chandigarh, a prevalence of 7\% was observed.\textsuperscript{10} India accounts for a third of the world’s asthma patients.

The risks for developing asthma depend on a complex interaction of hereditary and environmental factors. Risk factors are genetic predisposition (family history of atopy or asthma), perinatal factors (low birth weight, prematurity), exposure to allergens, infections (respiratory infections, especially those caused by respiratory syncytial virus), environmental air pollution, tobacco smoke, diet and obesity.\textsuperscript{11} Some of the differences are attributable to differences in the environmental exposures and healthcare infrastructure in India while others could be truly genetic or ethnic in origin. The review of literature shows a large variation in data with respect to the prevalence of asthma.\textsuperscript{12} Exposure to indoor pollutants represents a potentially modifiable cause of allergic sensitization and asthma. So, it becomes important to establish which environmental factors might influence the development of asthma in predisposed individuals. Based on the study results, preventive interventions will be planned appropriate to the patient and the location. Primary prevention includes creation of a productive environmental situation, leading healthy life-style, elimination of environmental factors or pollution.

**MATERIALS AND METHODS**

**Study Design**

The study was a prospective, open labeled and descriptive survey conducted using a specifically designed questionnaire. Necessary approval from the Institutional Ethics Committee was obtained before initiating the study.

**Place of Study**

The study was conducted in the Department of Pediatrics, MGM Hospital, Kalamboli and Kamothe, Navi Mumbai, India.

**Study Duration**

The study was conducted in between February 2012 and September 2013.

**Patient Selection**

Patients, aged 1 to 14 years, diagnosed as patients of asthma were selected for this study. Informed consent was obtained from each patient’s parent/guardian.

**Sample Size**

The study included 100 patients who confirmed to the predetermined inclusion and exclusion criteria.

### Inclusion Criteria

- Patients of either sex
- Within the age limit 1 to 14 years
- Patients who are known case of asthma and already on treatment
- Willing to enroll in a study with consent

### Exclusion Criteria

- Patients who are >14 years and <1 year
- Patients who are suffering from other systemic disorders (heart disease, etc.)
- Patient not willing and not giving consent

**Case Report Form**

It included the outpatient department number, demographic details and patients name, age and sex. A brief questionnaire was designed specifically for the study is attached with case report form which contained chief complaints, history of asthma, severity and the current status of asthma.

**Method**

Once their consultation with the General Physician/Resident was over, the prescriptions were collected and necessary details were noted on the questionnaire. The patient’s parents were also interviewed on the predesigned questionnaire. The details of the patients profile were noted down.

**STATISTICAL ANALYSIS**

Statistical analysis was performed using statistical software statistical package for the social sciences (SPSS) 17.0. The data were entered into SPSS sheet and analyzed. The data were presented using frequencies, percentages along with appropriate graphs and charts. The quantitative variables were presented using descriptive statistics, such as mean and standard deviation. The association between variables was tested using Chi-square test. The level of significance was set at 0.05. All p-values less than 0.05 are considered as significant.

**RESULTS**

During the study, 100 pediatric asthma patients’ prescriptions were included for data analysis as per inclusion and exclusion criteria. The study was conducted between April 2012 and March 2013 at MGM Medical College and Hospital, Kalamboli, Navi Mumbai, India.

The various parameters analyzed are as follows:

**Demographic Profile of the Patients**

The pediatric group patients were divided into three classes as per the age group. Most of the pediatric patients...
suffering from asthma were found in the age group of 1 to 5 years (Table 1). Sixty-four percent of the patients were males and 36% were females (Graph 1).

Distribution According to Socioeconomic Status

Out of 100 patients, 33% patients were from middle class, 51% (29% lower middle, 22% lower) were from lower socioeconomic status. Sixteen percent (13% upper middle, 3% high) were from upper strata of society (Graph 2).

Environmental and Seasonal Determinants of Asthma

Twenty-one percent of children suffering from asthma had a family history of asthma. Among children cold/respiratory illness (87%) followed by exercise and sports (70%) was the most common environmental trigger for asthma. Asthma symptoms worsened during day time and winter season in this group (Table 2 and Graph 3).

Association between Environmental Factors and Severity of Asthma

A significant positive association between environmental asthma triggers: smoke (p = 0.035), strong smell (p = 0.008), cold/respiratory illness (p = 0.035), hot/cold air (p = 0.03) and severity of asthma in children was observed. Winter season worsened the asthma symptoms (p = 0.047) in children.

### Table 1: Agewise distribution of pediatric patients

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>No. of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>6-10</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>11-15</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 2: Causative environmental and seasonal factors influencing asthma

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Percentage</td>
</tr>
<tr>
<td>Family history</td>
<td>21</td>
</tr>
<tr>
<td>Asthma triggers</td>
<td></td>
</tr>
<tr>
<td>Smoke</td>
<td>65</td>
</tr>
<tr>
<td>Strong smell</td>
<td>40</td>
</tr>
<tr>
<td>Exercise, sports</td>
<td>70</td>
</tr>
<tr>
<td>Having a cold/respiratory illness</td>
<td>87</td>
</tr>
<tr>
<td>Change in weather</td>
<td>51</td>
</tr>
<tr>
<td>Very hot or cold air</td>
<td>45</td>
</tr>
<tr>
<td>Pets</td>
<td>10</td>
</tr>
<tr>
<td>Others</td>
<td>19</td>
</tr>
<tr>
<td>Asthma symptoms</td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>72</td>
</tr>
<tr>
<td>Night time</td>
<td>55</td>
</tr>
<tr>
<td>Winter season</td>
<td>94</td>
</tr>
<tr>
<td>Fall season</td>
<td>62</td>
</tr>
<tr>
<td>Summer season</td>
<td>42</td>
</tr>
<tr>
<td>Spring season</td>
<td>19</td>
</tr>
</tbody>
</table>
DISCUSSION

Bronchial asthma is a disease of airway inflammation and airflow obstruction leading to bronchospasm characterized by the presence of intermittent symptoms including wheezing, chest tightness, dyspnea and cough together with bronchial hyper-responsiveness. It is a serious public health problem affecting both children and adults. In India, 3 to 5% pediatric population is affected by asthma whereas in adults, the prevalence ranges from 3 to 11%. Asthma affects an estimated 300 million individuals worldwide; the prevalence of asthma is increasing especially in children which is a chronic disease resulting in high mortality and morbidity worldwide.

Long-term treatment is generally required for an effective management, which has an effect on the cost of the therapy and patient's compliance. When uncontrolled, asthma can place severe limits on daily life and is sometimes fatal. So, proper prescribing patterns need to be followed in order to reduce the burden of disease in terms of morbidity, mortality and betterment in the quality of life. In addition to that, it also ensures the reduction of economic burden in the patients.

Drug utilization study helps to generate data on the drug usage pattern, quantifying various facts of drug therapy and evaluate the cost of therapy. The present study was aimed to assess the drug utilization in asthma therapy with special focus on inhalational corticosteroid and beta-2 agonist drugs as a quantitative type of prescription auditing to generate data with respect to the extent of variability of drug usage as well as the cost, among pediatric groups. Our objective was study correlation of asthma with socioeconomic status and environmental triggers. In present study, prescriptions of 100 pediatric patients were studied. On analysis of the prescriptions, it was found that asthma was reported more in male 77 patients (64%) as compared to females (36%). Majority of the prescriptions of the pediatric patients analyzed was in the age group 1 to 5 (45%) years. Out of total, 74% of the cases were suffering from moderate persistent asthma and 26% from mild persistent asthma. There were no cases of severe persistent asthma encountered in the study.

The risks for developing asthma depend on a complex interaction of hereditary and environmental factors. Risk factors that the patients were screened for included: genetic predisposition (family history of asthma), allergen exposures (sensitization and exposure to cockroaches, house dust mites, rodents, furry animals and molds); infections (respiratory infections, especially those caused by respiratory syncytial virus), environmental air pollution, tobacco smoke, diet and obesity. Sharma et al reported that in children, asthma attacks were increased during a particular season (86%), after exertion work (70%). The risk of asthma was more in children where smoke producing fuel was used (70%), presence of insects/pets/domestic animals (70%) and moisture, mold (42%) in the home, born prematurely/LBW (56%), with family history of atopy (44%), one smoker in family (38%), and who belonged to poor socioeconomic status (44%). No relationship was found with consumption of junk food and emotional factors. In the present study, 51% (29% lower middle, 22% lower) patients family was belonging to lower socioeconomic status. Family history of asthma was positive in 21% of children suffering from asthma. Among children, cold/respiratory illness (87%) followed by exercise/sports (70%) were the most common environmental trigger for asthma. Asthma symptoms worsened during day time and winter season in this group.

Exposure to indoor pollutants, such as pets, dust, mites as determined in the present study represents a potentially modifiable cause of asthma. So, it becomes important to establish which environmental factors might influence the development of asthma in predisposed individuals. A significant positive association between environmental asthma triggers: smoke (p = 0.035), strong smell (p = 0.008), cold/respiratory illness (p = 0.035), hot/cold air (p = 0.033) and severity of asthma in children was observed. Winter season worsened the asthma symptoms (p = 0.047) in children. Change in weather, exposure to hot, cold air and smoke makes the pediatric group more susceptible to have exacerbations of asthma signs and symptoms. Primary prevention includes creation of a productive environmental situation, leading healthy life-style, elimination of environmental factors. Early detection of atopy and the causal allergens, including food, prevention of the development of viral infections, treatment of atopic dermatitis, allergic rhinitis, etc. are important components of primary prevention. Reduction of allergen exposure, leading to subsidence of inflammation and hyperactivity in bronchi belongs to secondary prevention. Since the quality of indoor environment is potentially modifiable there might be opportunities for intervention to reduce asthma symptoms. In order to counteract the increasing prevalence in asthma, the significance of the indoor environment where children spend most of their time need to be given greater attention.

CONCLUSION

Among children, having a cold and respiratory illness followed by exercise and sports were the most common
environmental triggers for asthma. A significant positive association between environmental asthma triggers: smoke, strong smell, cold/respiratory illness, hot/cold air and severity of asthma in children were observed. Asthma symptoms worsened during day time and winter season.

REFERENCES