INTRODUCTION

Childhood asthma is the most common chronic pulmonary disease of children. The prevalence of asthma and allergies in general has considerably increased over the last two decades, particularly among children. The prevalence of asthma worldwide is very variable. For example, among the 6-7 years old, the prevalence of wheezing is 4.1% in Indonesia and 32.1% in Costa Rica. In Brazil, the prevalence of asthma is 7.3% in boys and 4.9% in girls aged 6 or 7 years and 9.8% and 10.2% in 13-14 years old. In a recent study, the prevalence of asthma in different parts of India varied between 4-20%. Regarding the prevalence of asthma in Pakistani children, a research done in 1997 revealed that 10% of children were suffering from this disorder. This study was repeated in 2006 and it was found that the prevalence had increased to 18% among children of 13-14 years age groups.

Epidemiological studies from other parts of the world have also confirmed that asthma prevalence is increasing in the world, especially in the developing countries. According to the Global Initiative for Asthma (GINA), prevalence of asthma in Pakistan is 4-5%. Although, precise reasons for this increase are unknown, it is likely that a number of environmental factors are at least partly responsible. There are very few studies that attempted to explore the role of risk factors for asthma in populations of children in Pakistan. It has not been demonstrated whether the risk factors are identical to those in Western countries, or that their relative importance is the same. Indeed, the available evidence tends to indicate the converse for some environmental elements. The identification of risk factors is essential for the adaptation of preventive measures and optimization of asthma patient management. The aim of this study was to identify the risk factors associated with asthma in children reporting to Isra University Hospital, Hyderabad.

PATIENTS AND METHODS

This case-control study included 398 age-matched children who attended the Pediatrics Department of Isra University Hospital, Hyderabad, from September 2005 to August 2006. The patient group comprised 200 asthmatic children and the control group comprised 198 non-asthmatic children.

The inclusion criteria for the patients were age between 12 months and 8 years; at least two previous episodes of wheezing and medically diagnosed asthma-based on clinical history, physical examination, a chest X-ray and the improvement of symptoms on treatment with...
jβ2-agonist. The controls were children of the same age, who attended the pediatrics department of the hospital immediately after selection of the index case. The inclusion criteria for the controls were having the same age (±3 months) as the corresponding patient and absence of respiratory disease or no previous episodes of wheezing. Once they had given consent for participation in the study, the parents were interviewed in their mother tongue and a member of the research team completed the questionnaire. Information was collected concerning family history of atopy, birth weight, current weight and height, environment (external and domestic pollution), history of breastfeeding, morbidity (circumstances in which asthma attacks occurred, clinical signs, hospitalization) and management (treatments received, medical follow-up). The latter variables were pertinent for the asthmatic children.

Pearson's chi-square test or Fisher's exact test was used to compare qualitative variables. Wilcoxon test was used to analyze quantitative variables. Differences were considered to be significant at p ≤ 0.05. The strength of the relationship between risk factors and asthma was evaluated by calculating Odds Ratios (OR) and their Confidence Intervals (CI) for all the factors tested. Multivariate analysis was not used because of the low frequency of some of the risk factors in the study population.

RESULTS

There were a total of 398 subjects including 200 asthmatic and 199 non-asthmatic children. The children were aged between 12 months and 12 years [mean age=35.9 ± 17.7 months for the asthmatic children and 38.1±18.9 for the control group, median=34 months]. Sixty percent of the children were boys and 40% were girls. Of the asthmatic children, 7.7% weighed less than 2500g at birth, vs: 12.6% of the control children. Less than half children (41.1%) attended regular medical consultations for their asthma and 56% used anti-asthmatic treatment as needed. None of the children was on long-term treatment.

There was a significant relationship between place of birth and asthma (OR=3.3, 95% CI=1.0-12.2, p < 0.05) and between place of residence and asthma (OR=6.73, 95% CI=3.1-12, p < 0.0001). Over half the asthmatic children (52%) and only 15% of the control children, lived in inner city areas. Over a quarter of the asthmatic children (24%) compared to 14% of non-asthmatic children, lived in homes with at least one carpet (OR=2, 95%; CI=0.9-4.4, p=0.06).

The relationship between asthma and maternal smoking or paternal smoking considered separately was at the limit of statistical significance (p=0.06). However, the link between asthma and the presence of a smoker in the child's home (either or both parent or any other member of family) was significant (OR=2.2, 95% CI=1.1-4.3, p < 0.05). The frequency of animals, notably cats and dogs, at home was similar for the two groups. Asthmatic children were more likely to have a family history of atopy. Asthmatic children were much more likely to have a parental history of asthma (OR=26.8, 95% CI= 10.8-68.2, p < 0.0001) and rhinitis (OR=4, 95% CI=1.2-13.3, p=0.005) in Table I. The frequency of atopic dermatitis did not differ between the parents of the two groups of children. Of the asthmatic children, 62% were weaned before 04 months of age (median=5 months) vs. 40% of the children in the control group (6 months) [OR=2.4, 95% CI=1.3-4.4, p < 0.01] in Table II. The frequency of each of the risk factors was similar in children who had never been hospitalized and in those who had been hospitalized at least once. The role of the domestic environment did not seem to be a major risk factor.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Asthmatic children (%; n=200)</th>
<th>Control group (%; n=199)</th>
<th>Odd ratio 95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking mother</td>
<td>9.5 (19)</td>
<td>3.5 (7)</td>
<td>3.2 (0.76-15.4)</td>
<td>0.06</td>
</tr>
<tr>
<td>Allergic rhinitis in parents</td>
<td>16 (32)</td>
<td>4.5 (29)</td>
<td>4 (1.2-13.3)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Atopic dermatitis</td>
<td>6 (12)</td>
<td>2 (5)</td>
<td>-</td>
<td>N.S</td>
</tr>
<tr>
<td>Smoking father</td>
<td>34 (68)</td>
<td>22 (42)</td>
<td>1.86 (0.93-3.73)</td>
<td>0.06</td>
</tr>
<tr>
<td>Exclusively breast fed (4-6 months)</td>
<td>38 (70)</td>
<td>23 (45)</td>
<td>2.2 (1.1-4.3)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Early weaning (before 4 months)</td>
<td>62 (124)</td>
<td>40 (80)</td>
<td>12.4 (1.3-4.4)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Born in slum area</td>
<td>90 (180)</td>
<td>82 (161)</td>
<td>3.3 (1.0-12.2)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Resident of slum area</td>
<td>52 (104)</td>
<td>15 (29)</td>
<td>16.7 (3.1-14.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Living in flat or covered houses</td>
<td>85 (170)</td>
<td>60 (118)</td>
<td>5 (2.3-11.1)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

DISCUSSION

Asthma is more common in developed countries. Environmental factors and diet may explain the difference in prevalence of asthma in children. Because of rapid economic improvements in Pakistan, many of its cities are at different stages of modernization, resulting in increased prevalence of asthma. In this study, as the participants had the same genetic background, the differences in prevalence of asthma are more likely to be due to exposure to different environmental factors. Several studies have reported an association between...

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<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal at home</td>
<td>27 (57)</td>
<td>30 (59)</td>
<td>0.9 (0.4-1.8)</td>
<td>Ns</td>
</tr>
<tr>
<td>Carpet at home</td>
<td>24 (48)</td>
<td>14 (27)</td>
<td>2 (0.9-4.4)</td>
<td>Ns</td>
</tr>
</tbody>
</table>
Risk factors associated with childhood asthma

childhood asthma and parental asthma. Yahya et al. showed 47% of asthmatic children to have family history of asthma. In another study from Hyderabad by Sheikh et al. 50% asthmatic children had positive family history. The present results confirm these finding. Maternal asthma is the main risk factor. Waheed et al. mentioned 66% having positive family history along with 86% having allergic rhinitis and 15% having eczema. Environmental factors are increasingly being implicated in causation of asthma. In Africa, asthma is more common in children who live in urban areas than in those who live in rural areas. The present results are consistent with this finding. In contrast to what is observed in rural areas, wheezing and exercise-induced bronchospasm are closely linked to atopic sensitization in urban zones, as in Western countries. Children who live on farms are protected against the development of asthma and atopic diseases, probably by bacterial endotoxins. The role of place of residence and, therefore, lifestyle is illustrated by the doubling or tripling of the prevalence of respiratory symptoms in children, who immigrated to Australia 5 to 14 years ago from countries in which the prevalence of asthma was low.

There is increasing evidence that problems of socioeconomic deprivation, including substandard housing conditions and urban areas with poor healthcare services, correlate with high rates of asthma-related hospital admissions. Fahim et al. found that 81% of asthmatic lived in cramped congested houses with a large family occupying a single ill-ventilated room. Waheed et al. mentioned 41% of asthmatic had dust exposure. Exposure to tobacco is a risk factor that is clearly associated with the development of asthma in the first few years of life, by favouring persistent sensitization. This risk is higher in case of maternal smoking, especially if the mother smokes during pregnancy. Waheed et al. mentioned 36.59% asthmatic as having cigarette smoke exposure. In this study, that particular risk factor was found to play a minor role. The association between asthma and paternal or maternal smoking considered separately was found weak. By taking into account all the possible combinations corresponding to 'parental smoking' (mother only, father only, or both), the presence of a smoker in the child's immediate family was significantly associated with asthma. The relationship between asthma and the presence of carpets in the home was at the limit of statistical significance. This is consistent with the studies on Western populations. Children sensitized at least once in their first 3 years of life were found to have been exposed to significantly higher levels of dust mite allergen. Although, exposure to indoor allergens is associated with atopic sensitization to specific allergen; no link was found with asthma. In most studies, sensitization to dust mites has been shown to increase the risk of wheezing. Palmer et al. performed a transverse study of 2164 children aged between 8 and 18 years and found that moderate infection with Ascaris lumbricoides was associated with an increased risk of asthma, sensitization to pneumoallergens and bronchial hyper-reactivity to methacholin. Conversely, bacterial and viral infections during early childhood and chronic parasitic infection can reduce the risk of atopy and allergic diseases in children. The presence of animals in the home did not appear to be a major risk factor for asthma in this study, perhaps because domestic animals are less confined to the house. Waheed et al. showed animal or pet exposure as 18.28%. Results of the present study suggest that absence of exclusive breastfeeding was associated with development of asthma. Zeiger et al. critically evaluated 16 studies out of which nine prospective studies showed benefit and seven showed lack of effect. A study by Wright et al. has demonstrated that breast-feeding was most protective against wheezing and lower respiratory tract illness early in life. Breastfeeding may decrease allergic sensitization by reducing both through the exposure and intestinal absorption of food allergens. The protective role of human breast milk immunoglobulins, especially serum IgA, in inhibiting absorption of antigenic substances has been documented in human neonates.

The relationship between breastfeeding and asthma is unclear. The Tucson's study showed that the relationship between breastfeeding and repeated wheezing or asthma differs according to age, the presence or absence of maternal asthma and the presence or absence of atopy in the child. Thus, breastfeeding protected against recurrent wheezing before the age of 2 years. According to Sears et al. breastfeeding does not protect children against atopy and asthma and may even increase the risk. Conversely, according to Oddy et al. breastfeeding reduces the risk of asthma in young children, regardless of its duration. In Australian children, exclusive breastfeeding for longer than 4 months was found to protect against asthma, wheezing and atopy. In Pakistan, the practice of breastfeeding is common, and is highest in rural areas. The mean duration of breastfeeding is 18-24 months. All the children included in this study were breastfed. However, the asthmatic children were weaned significantly earlier than the others.

There were certain limitations of present study. It was a hospital-based study at a tertiary care hospital leading to selection of more severe disease. It was attempted to minimize the selection bias by using the definition of disease strictly. Moreover, there was no evidence that the association between asthma and any given risk factor was linked to asthma severity. Secondly, the sample size was small to determine the significant effect of all these factors.
difference for factors with low prevalence such as pets at home. One of the limitations of this study was the absence of an allergological study: no such study was conducted because of practical difficulties. It was, therefore, not possible to investigate in detail the relationship between asthma and certain allergens specific to the lifestyles considered.

CONCLUSION
In this study, familial atopic background, urban residence, passive smoking and early weaning were important risk factors for childhood asthma. There is a relationship between asthma and 'westernization' (domestic comfort, confinement, smoking among family members). Further studies are required to evaluate the precise role of the environment, parasitic infection and atopic sensitization in particular. However, passive smoking and early weaning are two important risk factors that can be reduced by public aawareness and education.

REFERENCES


