Environmental Risk Factors in Relation to Childhood Asthma in Rural Area

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Abstract

Asthma is a common chronic disorder with increasing prevalence both in children and adults. WHO estimates that annually 15 million disability adjusted life-years are lost and 250,000 asthma deaths are reported worldwide. Approximately 500,000 annual hospitaliza-tions (34.6% in individuals aged 18 y or younger) are due to asthma. To study the Relation-ship between environmental factors and childhood asthma in a rural area has been studied. A hospital based descriptive study was carried out in Punjab, over a period of one year in children (6-15yrs) having asthma. In 200 children studied (boys 64% and 36% girls), asthma attacks were increased during a particular season (86%), after exertional work (70%) and along with ARI(72%). The risk of asthma was more in children where smoke producing fuel was used (70%), presence of insects/pets/domestic animals (70%) and mois-ture, 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 socio-economic status (44%).Breast feeding was protective in reducing the incidence by (62%).No relationship was found with consumption of junk food and emotional factors. This study shows that asthma is an important public health issue in rural communities as in urban areas. Breast feeding, use of LPG for cooking, early treatment of ARI reduces incidence of asthma attacks. Further study of indoor and outdoor risk factors which trigger attacks of asthma and study of means to reduce or delay the development of asthma in susceptible individuals in this population is suggested.

Key words: Asthma; environmental; risk; smoke
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Introduction

Asthma is a chronic inflammatory disorder of the airways characterized by an obstruction of airflow, which may be completely or partially reversed with or without specific therapy. Airway inflammation is due to interactions be-tween various cells, cellular elements, and cytokines. In susceptible individuals, it causes bronchial hyper respon-siveness (BHR), which results into inherent tendency of the airways to narrow in response to various stimuli (eg, environmental allergens and irritants), causing symptoms including wheezing, breathlessness, chest tightness, and cough, particularly at night or after exercise.

Over 300 million people worldwide are affected by asthma, with a high negative impact on quality of life, productivity and health care costs. Evidence shows that the prevalence of asthma is increasing, especially in chil-dren [1]. The cost of illness related to asthma is around $6.2 billion. Each year, an estimated 1.81 million people (47.8% in individuals aged 18 y or younger) require treatment in the emergency department. Among children and adolescents aged 5-17 years, asthma accounts for a loss of 10 million school days and costs caretakers $726.1 million because of work absence[2]. 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, prematur-ity); exposure to allergens; infections (respiratory infec-tions, especially those caused by respiratory syncytial virus); environmental air pollution; tobacco smoke; diet and obesity[3].Environmental exposures in early life that affect immune maturation is the key factor. The indoor environment is a likely candidate since children spend

significant time indoors at a time when immune deviation usually occurs. 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. 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 environ-ment is potentially modifiable there might be opportuni-ties for intervention to reduce asthma symptoms. In order to counteract the increasing prevalence in asthma, the significance of the indoor environment where children grow and spend most of their time need to be given greater attention.

Methods

A hospital based descriptive study was carried out in rural area of Punjab, India on a population of 200 children, over a period of one year to determine the relationship between frequency of asthma attacks with the selected individual and family characteristics. The conceptual framework for this study was based on Modified Betty Newmen's model which concerns with identification of factors significant in causing asthma attacks. Criteria for sample selection was patients between age group 6-15yrs,attending Pediatric OPD, diagnosed with asthma (International Classification of Diseases, Ninth Revision, code 493) by a Pediatrician and were willing to partici-pate in study. The information was collected through a structured ques-tionnaire which was given to both the child and a parent or caregiver. The questionnaire included information re-levant to asthma risk factors, including socioeconomic status (age, gender, educational level, employment sta-tus), emotional stress, physical exertion, dietary pattern, family history of asthma, environmental tobacco smoke, the use of indoor combustion devices, usage of pesti-cides, birth weight and or premature birth, breast-feeding history. The last section of the questionnaire included information about frequency of asthma attacks. Data analysis were performed using Split half method of reli-ability by using Karl Pearson's coefficient of correla-tion.

Results

In studied population of 200 children(64% boys and 36% girls)there were 44%children of age group 6-9years, 30% of 9-12 years and 26%of 12-15 years,22% belonged to middle class,34% from lower middle class and 44%were from poor socio economic status.The risk of having asth-ma was elevated in the families with history of atopy (44%), where one member was habitual smoker (38%), among children born prematurely/low birth weight (56%), where smoke producing fuel used(70%),presence of in-sects/pets/domestic animals in the home (70%) and pres-ence of moisture, mold(42%). Asthma attacks were in-creased during particular season(86%) maximum (60%) during winter and (16%) autumn. The risk of asthma at-tacks increased after exertional work (70%) and along with ARI. No relationship was found with consumption of junk food and emotional factors like exa-mination stress, laughing/crying, tense atmosphere in the family. The risk of having asthma was lower among the children who were breast fed (62%) (Table 1).The envi ronmental as well as physical factors proved significant in asthma patients. Breast feeding proved to be protec-tive, with breast fed children having lower risk than those that were not. While most of these results were not statis-tically significant, due to the small sample size, they are in the expected direction. These results confirm the role of susceptibility factors in asthma and prove that environ-mental factors contribute to the incidence of asthma.

Table I. Characteristics of the study population.

Sr No.	Questions	Yes n(%)	No n(%)
1	Born prematurely/low birth weight	56	54
2	Breast feeding	38	62
3	Residential area rural	58	42
4	Presence of moisture, mold at home	48	52
5	Smoke producing fuel used	70	30
6	Anyone in the family habitual smoker	38	62

7	Use of scent sticks at home	56	54
8	Presence of insects/pets/domestic animals	70	30
9	Asthma attack during particular season	86	14
10	Asthma attack followed by ARI	72	28
11	Any family member diagnosed with asthma	08	92
12	Family history of atopy	44	56
13	Consumption of junk food	48	52
14	Does junk food precipitate asthma attacks	10	90
15	Emotional stress during examination days	18	82
16	Asthma attack due to family tension	08	92
17	Asthma attack after exertional work	70	30
18	Asthma attack after episodes of laughing/crying	20	80

Discussion

Incidence of asthma is reported to be very high in minor-ity populations and in people living in poverty[2,3].This difference is reflected in the number of emergency room visits, hospitalizations and death, and is thought to reflect differences in risk factors of exposure and asthma control with socioeconomic status. Asthma, the most common chronic disease of childhood, has major public health and financial consequences [4]. Although children of low-income families and minority children, are more likely to have asthma, as they are less likely to receive optimal medical care. These children have been shown to receive fewer preventive asthma medications [1,2,5,6,7].

The results of the present study are consistent with the evidence that premature children are at an increased risk of asthma, the risk being increased by two-fold for the subjects born prematurely [3,8]. Previous studies have suggested that the development of protective immune responses to microbes early in life may reduce the likeli-hood of the development of allergies, and as a result the development of asthma[9].Perinatal factors, including gestational age and birth weight, influence the develop-ment of atopy in early life, increase the risk of developing lower respiratory tract infections, and play a possible role in the development of asthma in later life [3,8]. Human milk contains numerous components protecting the infant against infections, including factors that provide specific immunity, nonspecific protective factors that inhibit the binding of bacterial pathogens and their toxins, and lipids that may disrupt enveloped viruses[10].Breast milk con-tains cytokines and growth factors that may play a role in modulating the development of asthma by preventing sen-sitization to environmental allergens, enhancing infant lung development and reducing susceptibility to respira-tory infections [11]. The role of breastfeeding as a protec-tive factor against asthma and atopic diseases, however, continues to be controversial, with some studies showing a negative effect of breastfeeding [12,13] and others showing a protective associtation[14,15,16]. Immunoprotection conferred by human milk may vary in relation with the mother's atopic constitution, infections, immune status, and diet. Our results support a strong protective effect of breastfeeding against asthma in children.

The risks for developing asthma depend on a complex interaction of hereditary and environmental factors. Risk factors that have been identified include: genetic predis-position (family history of atopy or asthma); perinatal factors (low birth weight, prematurity); allergen expo-sures (sensitization and exposure to cockroaches, house dust mites, rodents, furry animals and molds); infections (respiratory infections, especially those caused by respira-tory syncytial virus); environmental air pollution; tobacco smoke; diet and obesity [17,18].

We found an increased risk of current asthma in children associated with a family history of asthma, environ-mental smoke exposure and air pollution (Smoke produc-ing fuel used, Anyone in the family habitual smoker, Use of scent sticks at home), and the results were statistically significant. Maternal smoking during pregnancy increased the occurrence of physician-diagnosed asthma during childhood suggesting that the exposure to tobacco com-promises

the development of the fetal lungs and as a re-sult, an increased risk of developing asthma[19,20]. Pets are one of the most common indoor allergens along with dust mites, cockroaches and molds. In many countries, over 50% of homes have cats and/or dogs [21]. In our study population, 70% households had pets in the house. There was increased risk of asthma in children living in homes with pets. Emotional as well as dietary factors did not contribute significantly as risk factors for precipitating attacks of asthma.

The major limitation of our report is the size of the popu-lation studied. Because the population available for inves-tigation was small, few of the results were statistically significant, although most of the results were in the direc-tion expected from previous studies. This problem is dif-ficult to avoid when one studies a small population. We believe our results to be useful in spite of this problem.

Conclusion

This research identified that asthma is not only a problem for urban city minority populations, but also is an impor-tant public health issue in rural communities. Rural chil-dren are at risk of exposure to a number of perinatal and environmental factors which may be causally related to the increasing rates of asthma in this population. Reduc-ing exposure to indoor allergens, especially in genetically susceptible children, can reduce the development of aller-gic sensitization and this may prevent childhood asthma and decrease the frequency and severity of asthma attacks [22,23]. Certain mechanical interventions are effective both in reducing allergen loads in the home and in im-proving asthmatic children's respiratory health.

Several potential indoor and outdoor risk factors for asthma in rural homes, the avoidance of which may reduce or delay the development of asthma in susceptible individuals. Factors that contribute to this dilemma include inadequate preventive medical care for asthma management, inade-quate asthma knowledge and management skills among children and their families, psychosocial factors, and en-vironmental exposure to allergens or irritants. Since dis-parity of asthma mortality and morbidity among children in rural area is closely linked to socioeconomic status and poverty, measures to reduce exposure to environmental allergens and irritants and to eliminate barriers to access to health care are likely to have a major positive impact. Interventions for children in rural areas must focus on prevention of asthma symptoms and promotion of well-ness. Future research should focus on improving the ef-fectiveness of education on home asthma triggers, and understanding long-term children's health effects of the interventions that have proven effective in reducing asth-ma triggers.

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