Evaluation of risk factors in patients diagnosed as bronchial asthma

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ABSTRACT

Bronchial asthma is a public health problem with gradually increasing importance, affecting more than 100 million individuals worldwide and found independently of the level of development of the country. Factors related to lifestyle and the environment form the basis for the increase in the prevalence of the disease.

Aim: To evaluate our patients being followed-up with a diagnosis of bronchial asthma at the Allergy Clinic for risk factors and to determine their sociodemographic characteristics

Material and Method: The risk factors of 3025 patients followed-up with a diagnosis of bronchial asthma at the Allergy Clinic of the Ministry of Health, Ankara Diskapi Children's Diseases Training and Research Hospital between January 1995 and March 2000 were evaluated retrospectively.

Results: A high percentage of our patients suffered from both asthma and allergic rhinitis and 45 % of our asthmatic patients had allergic rhinitis while 93.5 % of those with allergic rhinitis were also asthmatic. Asthma was more common in males and those born in the summer months. 57.6 % of the patients had a history of atopy. Passive smoking was observed at a high rate and cigarette smoke was the most important factor increasing the symptoms. The symptoms increased during the winter. 92.8 % of the patients lived in the city. The average Ig E level was high and 60.9 % of the patients were atopic on the skin prick test.

Results: Asthma seems to be an important health problem in our country. Recognizing the risk factors is important for the diagnosis and prevention of the disease.

Key words: Asthma. Risk factors. Childhood. Atopy. Breast fed. Skin prick test.

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INTRODUCTION

Bronchial asthma is characterized by respiratory airway obstruction developing as an exaggerated response to various stimuli and appearing as recurring crises that resolve simultaneously or with treatment. Many epidemiologic studies in the last 10 years have demonstrated that bronchial asthma is a disease affecting world communities without any regard for boundaries. Increased information on the pathogenesis and risk factors of the disease has not prevented the increase in asthma prevalence. When we look at the epidemiological data, the effects of regional variability and different environmental conditions on the incidence of the disease is striking[1]. The fact that allergic diseases such as asthma, rhinitis and atopic dermatitis run in families and are seen together more often in single-cell twins indicate a role for genetic factors[2]. Risk factors are provided in table I[3].

MATERIAL AND METHOD

Patients followed-up with a diagnosis of bronchial asthma at the Allergy Clinic of the Ministry of Health, Ankara Diskapi Children's Diseases Training and Research Hospital between January 1995 and March 2000 were evaluated retrospectively for sociodemographic characteristics and risk factors.

History:

– Age, month of birth, feeding history, past diseases.

– Symptoms, characteristics of symptoms.

– Predisposing factors or factors increasing the severity.

– History of atopy in the family.

– Place of residence.

– Characteristics of the residence, smoking at home, pets at home.

Laboratory tests: Total Ig E, specific mix Ig E and skin prick tests were used to diagnose atopy. The total Ig E was studied with the ELISA (Enzyme linked immunoassay) method and the specific mix Ig E (mites, pollens, milk, eggs) with the immunoassay method.

Prick skin test: The patient's antihistaminic medication, if any, was stopped at least three days before the test. A drop of the allergen solution at standard activity and concentration was placed on the skin and let to seep into the epidermis with the help of a lancet. The allergens used included pollens, fungal spores, mites, animal fur and various food substances (Stallergenes S.A.-France). The skin reaction was graded 20 minutes later. The wheal and flare reactions were graded between zero to four by comparing the size with negative (antigen diluting solution) and positive (histamine hydrochloride 10 mg/ml) controls. A total of 38 allergen solutions, including the negative and positive control, were employed.

Statistical Analysis: The definitions were provided as number and percentage for discrete variables and mean and standard deviation for continuous variables.

RESULTS

The files of 3400 patients followed-up at the Allergy department were evaluated retrospectively. Of these patients, 3025 had been diagnosed as bronchial asthma and 1667 of these were being followed-up as bronchial asthma, 1358 as bronchial asthma + allergic rhinitis and 94 as allergic rhinitis.

The characteristics of the 3025 patients being followed-up with a diagnosis of Bronchial Asthma are detailed in table II.

Table I

Risk factors

Personal risk factors	Environmental risk factors
Positive for atopy	Cigarette smoke
Age	Concentration of allergens
Month of birth	Air pollution
Race	Lifestyle
Sex	Financial status
Past infections	
Vaccination	
Nutrition	

Table II

The sociodemographic characteristics of the patients

	n	%
Sex		
Male	1917	63.3
Female	1108	36.7
Mean Age	5.5 ± 3.3 (3 days-16 years)	
Average breast-feeding duration (months)	10.5 ± 8.12	
No breast-feeding	179	5.9
Four months or less	548	18.1
Initiation of complementary food (months)	4.5 ± 3.38	
At 3 months or earlier	760	25
Season of birth		
Summer	838	27.7
Spring	765	25.3
Fall	741	24.5
Winter	681	22.5
Infection history		
Varicella	964	31.8
Measles	598	19.8
Mumps	538	17.8
History of food intolerance	127	4.2
History of drug allergy	114	3.8
Positive family history of atopy	1743	57.6
Factors increasing symptoms		
Cigarette	1549	51.2
Exercise	754	24.9
Seasonal exacerbation of symptoms		
Winter	1195	39.5
Spring	615	20.3
Fall	452	14.9
Summer	162	5.4
Passive smoking	1626	53.8
Kept pets in the house	394	13
Living area		
City	2807	92.8
Village	218	7.2

The ages were 3 months to 16 years and the mean was 5.5 ± 3.3 years. The distribution was 79 males, 21 females (100 patients) less than twelve months old; 855 males, 434 females (1289 patients) aged 1 to 5; 691 males, 485 females (1176 patients) aged 5 to10; 290 males, 170 females (460 patients) aged 10 or over. 45.9 % of the patients were less than 5 years old, 84.7 % were less than 10 years old and 15.3 % were older than 10. The male female ratio was 3.7 in those less than 12 months old, 2.05 in those under 5, 1.4 in those 5 to 10 years old and 1.7 in those older than 10.

Breast-feeding was for 10.5 ± 8.12 months on average. 2298 (76 %) patients had been breast-fed for various periods over four months. 882 (29.1 %) patients had been breast-fed for six months or less and 1964 (64.9 %) for more than six months.

114 (3.8 %) patients had a history of drug allergy. The distribution was: penicillin in 72, trimethoprim-sulphamethoxazole in 21, sulphosalicylic acid in 13, penicillin + trimethoprim sulphamethoxazole in 3, penicillin + sulphosalicylic acid in 2 and sulphosalicylic acid + trimethoprim sulphamethoxazole in 3.

127 (4.2 %) patients had a history of food intolerance. 28 had intolerance to milk, 93 to eggs and 6 to milk + eggs.

A family history of atopy was present in 1743 (57.6 %) patients. 1110 (36.6 %) patients reported bronchial asthma in the family while 240 (7.9 %) reported allergic rhinitis, 171 (5.7 %) reported eczema, 123 (4 %) reported urticaria and 99 reported (3.3 %) drug allergies.

394 (13 %) patients kept pets in the house. Of these, 318 (10.5 %) had birds, 36 (1.2 %) had cats, 31(1.02 %) had dogs and 9 (0.29 %) had rabbits.

The characteristics of the patients' beds, pillows and quilts are detailed table III.

Results of investigation related to atopy in the patients are showed table IV. 625 patients were tested for specific Ig E; 325 (48 %) were positive and 351 (52 %) negative. The skin prick test was applied to 1902 of the 3025 asthmatic patients and 1146 (60.3 %) were found to be atopic. Of the atopic patients, 149 (13 %) had monoallergen sensitivity while 997 (87 %) were sensitive to two or more allergens.

DISCUSSION

Asthma is the most frequent chronic disease of childhood. Its prevalence and severity has increased in recent years. Asthma can be seen at very early periods of life, even in the first few months. It can be difficult to make the diagnosis as infants, toddlers, schoolchildren and adolescents have different anatomical and physiological characteristics. These children need a well thought-out clinical approach[4].

Most childhood asthma is in males. The male/female ratio is reported as 1.2-2/1. This rate increases gradually towards adolescence[3,4]. The male ratio was higher in our study at 1.7/1. The disease was seen more frequently in males in all age groups and the male/female ratio decreased towards adolescence.

Age is a secondary risk factor. The disease peaks at ages 5 to 10. Asthma starts under one year of age in 20 % of the patients, before 5 years of age in more than half (approximately 60 %), and in late childhood in 10 %[4]. Of our patients, 45.9 % were less than 5 years old, 84.7 % were less than 10 and 15.3 % were older than 10.

Studies have reported that long-term breast-feeding can decrease the prevalence of atopic disease while other have no found no such influence[5,6]. Breast-feeding decreases the incidence of wheezing by decreasing the incidence of respiratory infections in the first few months of life but does not prevent the development of wheezing or asthma later on. Kalyoncu et al[7] have reported from their 1992 study on 1036 primary school students in Ankara, Turkey that 95.4 % of the children had been breast-fed for various periods and that 61.6 % had been breast-fed for more than six months. The duration of breast-feeding in our study was 10.5 ± 8.12 months. 179 (%5.9) patients had never been breast-fed while 2846 (94.1 %) had been breast-fed for varying periods. 882 (29.1 %) had

Table III

The characteristics of the patients' beds, pillows and quilts

	Cotton		Wool		Foam		Synthetic material		Feathers	
	n	%	n	%	n	%	n	%	n	%
Pillows	1231	40.7	1238	41	50	1.7	441	14.6	65	2
Quilts	1131	37.4	1380	45.6	24	0.8	478	15.8	12	0.4
Beds	974	32.2	1188	39.3	312	10.3	548	18.1	3	0.1

been breast-fed for 6 months or less while 1964 (64.9 %) had been breast-fed for more than 6 months.

Starting the child on infant formula before three months and starting complementary food early have been reported to be risk factors for asthma[8]. Our patients had been started on complementary food at month 4.5 ± 3.38 on average. 2265 (75 %) patients had been started on complementary food at various times starting from 3 months. Most of our patients had been started on complementary food after 3 months.

It is stated that the month of birth has an effect on the development of Ig E due to the inhaled allergen concentration. Children with pollen allergy are usually born March to June while those with house dust mite allergy are usually born May to October. Asthma is reported to be seen less frequently in those born during the winter. The reason for this is supposedly the increased tree and grass pollens in summer and spring and the increased house dust concentration in the fall[5]. Our results supported this and most of our patients had been born in the summer while winter was the season of the smallest number of births.

Childhood infections and vaccines are reported to have an increasing or decreasing effect on the prevalence of allergic disease. The reverse correlation between atopy and infection is explained with the stimulation of the TH-1 response in T lymphocytes with recurrent infection. Viral infections may trigger asthma attacks but asthma prevalence is low where respiratory infections are common and their protective role in becoming sensitized to allergens should be noted. The increased prevalence of asthma, especially in developed countries, is explained with the hygiene theory. The improved hygiene and decreased incidence of infection is seen as a factor in the increase of atopic diseases. Infections stimulating the TH-1 response may suppress the development of asthma[9]. A study on African children has shown that past measles infection is a protective factor against atopy[10]. Manticardi et al[11] report that children who have had infections spreading by the orofecal route have a significantly lower prevalence of atopy than those who have had viral infections spreading by air (MMR, varicella, CMV, HSV1). 538 (17.8 %) of our patients reported an episode of mumps, 598 (19.8 %) of measles and 964 (31.8 %) of varicella, all air-borne diseases.

Although allergic sensitivity to aspirin is well-known, nonsteroidal anti-inflammatory drugs such as aspirin, indomethacin and ibuprofen may initiate an asthmatic crisis mostly by a non-allergic mechanism[12]. Atopy is not a predisposing factor for the development of penicillin sensitivity and it may be said that fatal anaphylactic reactions develop more easily in these persons[13]. Of our patients, 114 (3.8 %) had a history of drug allergy. The most common of these was allergy to penicillin, present in 72 patients.

It has been reported that patients who have cow milk and egg intolerance before two years of age more commonly develop sensitization to aeroallergens by four years of age[8]. 127 (4.2 %) of our patients had a history of food intolerance.

The main personal risk factor for bronchial asthma is atopy in the individual or his/her family. The most important risk factor is atopy in the family. Some genes related to concurrent atopy, Ig E response and asthma have been found. These genes are located on chromosomes 5, 11 and 14[3,9,14,15]. Children whose parents do not have extrinsic asthma have an asthma prevalence of 8 %, which increases to 15 % with asthma in one parent and 28.6 % with asthma in both parents. The incidence of asthma in first-degree relatives is 3-6 times of normal[2]. Of our patients, 1743 (57.6 %) had a history of atopy in the family making it an important risk factor for our patients as well.

Findings indicate that passive smoking increases the sensitivity of upper and lower respiratory airways, has a negative effect on lung function parameters and lung development and that is also increases symptoms and hyperreactivity in asthmatic children. Smoking at home seems to increase emergency service visits, number of attacks, hospital admissions and the dosage of the medication used[14,16]. Although the role of passive exposure to cigarette smoke in the development of asthma is debatable, studies indicating that it increases the severity of asthma are becoming more convincing[15]. F. Demirel et al[17] have reported the rate of passive smoking as 72.1 % for asthmatic children while this rate is 28 % in the USA[18]. 1626 (53.8 %) of our patients reported passive smoking and 1549 (51.2 %) reported cigarette smoke as one of the factors increasing the symptoms.

Exercise is a common trigger for asthma in children and young adults. Exercise increased symptoms in 754 (24.9 %) of our patients.

The symptoms increased in the spring and winter months in 2262 (74.7 %) patients and only in the winter months in 1195 (39.5 %) patients. This indicates that the symptoms are related to the increased pollen count in the spring and to the infections and air pollution in the winter.

Asthma in children and young adults is seen more often in cities while adult asthma is not affected by the place of residence. The asthma prevalence and mortality is increased in minorities living in financial difficulty in cities with inadequate health systems[15,19]. There has been a significant increase in air pollution

in socioeconomically advanced or developing countries due to increased industrialization and urbanization. Correspondingly, 2807 (92.8 %) of our patients lived in the city.

Allergic sensitization is a risk factor for the development of an allergic disease. Exposure to allergens during the early stages of life make it easier for specific diseases to develop later on, possibly due to the developing immunological sensitivity. House dust mites, cockroaches, pollens, animal epithelium are the most important sources of allergens leading to sensitization in the early stages of life[15]. The bed, pillows and quilts are important sources for house mites. The most common material for the beds (1238, 41 %), pillows (1380, 45.6 %) and quilts (1188, 39.3 %) of our patients was wool. This indicates that wool beds, pillows and quilts are a factor in sensitization.

Animal fur was a significant cause of sensitization and 394 (13 %) of our patients had a pet in their house. Demirel et al[17] have reported the percentage of those keeping a pet as 20 %. The percentage of those keeping a pet at home has been reported as 53 % in the USA[18].

Ig E levels are high in 75-83 % of children with allergic asthma. However, a normal or low value does not eliminate the diagnosis of asthma. It is rare for children to have high Ig E levels without an allergic disease[4]. The average total Ig E level of our patients was high at 402.7 ± 646 IU/ml (min: 1- max: 4000).

Specific Ig E determination in the blood is less sensitive, more expensive and more time-consuming than the skin prick test but less traumatic. The skin reactivity to histamine and allergens is low in infants and young children and this is therefore a preferred method in young children, those with extensive eczema or dermographism and children who carry a risk of anaphylaxis due to hypersensitivity[4]. The test was positive in 325 (48 %) of the 625 patients that we tested with specific mix Ig E.

Aeroallergens, and especially in-house aeroallergens, lead to sensitization in many parts of the world. Mites, cockroaches and animal species are the most important in-house aeroallergens. The main aeroallergens outside the home environment are pollens and fungal spores[21]. House dust mites are important aeroallergens in many countries (8, 21-23). 1902 of our 3025 asthmatic patients had received the skin prick test while others did not receive the test because they were too young or because of other reasons. 1146 (60.9 %) of the 1902 patients receiving the skin prick test were atopic. The most common allergens were house dust mites, observed in 726 patients (63.3 %). Pollen allergy was second with 565 (49.3 %) patients.

Although there are many studies on asthma that have led to a better understanding of its physiology and major advances in its treatment its incidence is increasing. Asthma is also an important health problem in our country. New research on the epidemiology, risk factors and clinical characteristics of asthma will provide better information.

We emphasized the risk factors of a large number of patients, followed-up with a diagnosis of asthma, retrospectively. We believe a comprehensive approach considering all details of the disease is required when confronted with allergic patients.

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