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Remission of Childhood Asthma after Entering the Second Decade of Life: A Hospital Based Cohort

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ABSTRACT

Asthma is the most common chronic disease in children. The natural history of asthma is often characterized by periods of remission and relapse. The aim of this study was to determine the remission rate of asthmatic children after entering the second decade of life and remission related factors in a hospital–based cohort.

The study population was asthmatic children who were diagnosed, registered and followed up in outpatient pediatric clinic of a university hospital in Ahvaz, Iran. Remission was assessed in the age of 11 to 15 years-old if ≥ 5 years passed from the time of diagnosis. Clinical remission was defined as the absence of asthma symptoms for at least one year without the use of inhaled corticosteroids and short acting β_2 agonists.

In the cases with clinical remission, spirometry and exercise tests were conducted to document complete remission. The study included 197 adolescents (mean age of 13.1±1.9 years). Clinical remissions were found in 71 cases (%36) but according to spirometry criteria, 65 children (33%) were in complete remission. There was no significant difference between the genders. The remission rate was positively correlated with age of onset, and inversely correlated with family history of asthma, atopic dermatitis, hospitalization due to asthma, passive smoking and the need to use long-term inhaled corticosteroid.

Based on this study, approximately one third of asthmatic children showed remission up to 15 years of age which is a moderate rate compared to other studies.

Keywords: Asthma; Children; Remission rate

INTRODUCTION

Asthma is the most common chronic disease and the most common cause of hospitalization in children.[1,2] The natural history of asthma is often characterized by periods of remission and relapse[2]. Many children with asthma undergo remission in adolescence.[3, 4, 5, 6]

Asthma may relapse in some adults whose disease remits in adolescence.[3, 5, 6]

Asthma remission rates from 10% to 70% have been reported in cohort studies.[3] The variability in reported remission rates may relate to various

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definitions used to define remissions, different age ranges of study populations and various medications used for control of asthma. Environmental conditions and genetic factors may also influence remission rates of asthma in different areas. Several studies have suggested that female gender,[7,8,9,10] personal and family history of atopy,[9,10] symptom severity,[3,5,9] onset of symptoms after the age of 2 years, [3,9,11,12] obesity[13] and passive or active smoking[7] might be the risk factors related to persistence of asthma in adulthood.[3]

For further understanding of the natural history of asthma, the current study was designed with the aim of determining the asthma remission rate and remission related factors in asthmatic children entering the second decade of life.

PATIENTS AND METHODS

The present study is a hospital-based cohort study. The study population included asthmatic children who were registered and followed up in outpatient pediatric clinic of Golestan University Hospital in Ahvaz after the year 1997. These patients had a history of at least two asthma attacks in the past. Remission was assessed in the age between 11 to 15 years of age if ≥ 5 years passed from the time of their diagnosis. Patients with other chronic diseases such as congenital or acquired heart and lung disease, rheumatologic diseases and immunodeficiency were excluded from the study. Inhaled corticosteroids were prescribed for all asthmatic children of different levels of asthma severity except for the mild intermittent category.

Methods

Parents were requested to attend the clinic with their children by phone call. They filled out the questionnaires together and were interviewed personally. Standard ISAAC (International Study of Asthma and Allergies in Childhood) questionnaire was used as the base to evaluate asthma symptoms.[14] Clinical remission was defined as the absence of asthma symptoms for at least one year without the use of inhaled corticosteroids and short acting β_2 agonists. In the cases with clinical remission, spirometry and exercise tests were done to document complete remission. The FEV1/FVC ≥ 0.8 in spirometry plus normal exercise challenge test (<% 15 decrement or no reduction in FEV1 after 6-8 minutes running on treadmill) was considered as spirometric criteria for normal pulmonary function and complete remission[15].Adolescents with continuing symptoms according to ISAAC, were defined as persistent group. The height (cm) and weight (kg) of all the children were measured. BMI was calculated by dividing weight in kg by the square of the height in meters (kg/m^2). Obesity was defined as BMI > 95th percentile for age and sex of patients.

Statistical Analysis

The collected data were analyzed with SPSS 15.0 software. The characteristics of the study population and the frequency of remission and persistence of symptoms were described with summary statistics. Logistic regression was used to estimate unadjusted and adjusted odds ratios, significance levels, and confidence intervals for factors associated with remission or persistence of symptoms. P-value less than 0.05 was considered as significant

RESULTS

The study included 197 asthmatic adolescents with mean age of 13.1 years and standard deviation of 1.9. The male/female ratio was 1:1.8.Table 1 shows characteristics of the study population.

Clinical remission was found in 71 cases (36%) and according to spirometry criteria, 65 children (33%) were in complete remission.

The remission rate in female and male patients was 31.4% and 34.6%, respectively. In approximately 90% of the study population, asthma symptoms had began before six years of age. The mean age of starting asthma symptoms was 3.9 years. It was 3.8 years in persistent group and 4.2 years in remission group. Table-2 shows characteristics of the study members in two persistent and remission groups.

Table 1. Characteristics of the Total 197 study individuals

Variables	All patients(n=197)
Sex	No. (%)
Female	127(64.5%)
Male	70(35.5%)
Family History of Asthma	83(42.1%)
Passive smoking	43(21.8%)
History of Atopic dermatitis	66(33.5%)
Obesity	50(25.4%)
Need to use inhaled corticosteroids	178(90.4%)

Table 2. Characteristics of the 197 study individuals in two persistent and remission groups

Variables	persistent group (n = 132)	remission group (n = 65)	OR (95% CI)	P-value
Sex	No. (%)	No. (%)		
Female	48(36.4%)	22(33.8%)	1.72 (0.61-2.95)	0.46
Male	84(63.6%)	43(66.2%)		
Family History of Asthma	64(48%)	19(29.2%)	0.36 (0.11-0.60)	0.007
Age of starting asthma symptoms	No. (%)	No. (%)		
≤2yr	44(33.3%)	11(16.9)	1.22 (1.02-1.49)	0.046
>2yr	88(66.7%)	54(83.1)		
Passive smoking	35(26.5%)	8(12.3)	(0.12-0.73) 0.30	0.019
History of Atopy dermatitis	51(38.6%)	15(23.1%)	(0.05-0.38) 0.16	0.04
Obesity	34(25.8%)	16(24.6%)	(0.97-1.12) 1.04	0.23
Need to use inhaled corticosteroids	131(99.2%)	47(73%)	0.019 (0.001-0.149)	0.001
Hospital admission due to Asthma	93(70.5%)	6 (9.2%)	(0.05-0.38) 0.16	<0.001

Among the patients with a history of passive smoking, 81.4% did not fulfill the remission criteria (Table 2).

DISCUSSION

In the present study complete remission rate of asthma in adolescents up to age 15 years was 33%, which was compatible with the study conducted by Sears and colleagues,[7] and is fairly close to the results of Guerra et al. (42%) and Porsbjerg et al. (40%) studies.[13, 16] Cohort studies in different places of the world have reported the remission rates of asthma from 10 to 70%.[3] These wide spectrum results may be due to differences between the studies in terms of definition of remission, study design, duration and population age range.

This study showed a significant correlation between the age of disease onset and clinical remission, in which disease onset after two years of age increased the chance of improvement. The same result was also reported by Sears et al.[7] while Morais-Almeida et al[11]. and Jenkns et al[9]. reported the onset of asthma symptoms after the age of two as a risk factor for persistent asthma. Difficulty in asthma diagnosis at early ages due to limitation in performing spirometry as well as the similarity of asthma symptoms with some diseases (such as viral bronchiolitis or pneumonia), may interfere with determining the accurate age of disease onset; therefore some cases who were considered as remitted patients in adolescence may have not been asthmatic at all. Furthermore, wheezing at early ages may not be noticed by the parents and thus the onset of symptoms is not recorded properly. In the present study up to 15 years of age, there was no significant difference between study groups in terms of gender. In some studies, the female gender had been considered as a risk factor for asthma persistence [7, 8, 9] but in a study conducted by To et al. up to age 12 years, male patients were shown to be at a higher risk for persistent asthma symptoms.[2] These conflicting results might have been caused by different age ranges studied and different follow-up durations of the studies. During and after puberty, because of enhanced lung and airways growth, asthma remission might be more expected in males [3]. Therefore, there is an increased chance of remission in males in the studies which have longer follow-ups.

The significant relationship between positive family history of asthma and persistence of the symptoms in the present study which was in agreement with a group of studies from different regions of the world.[3,9,10,11] might suggest that family history of asthma is an

important predictive factor for persistent asthma symptoms independent of the environmental factors.

In the present study the improvement of asthma in patients with a history of atopic dermatitis was almost half of the subjects with no history of this disorder, as reported in the previous studies.[10,11,16]

According to the results of the present study, the children who were at least once admitted to the hospital because of asthma were six times more at risk of persistent asthma symptoms. This might be due to more severe disease in and poor control of asthma in these patients. To and colleagues in their study also concluded that children with a history of hospitalization in the first year after diagnosis, have three times more chance of asthma that persists to the age of 12-years.[2]

While in the study of Guerra et al. obesity was reported as an independent prognostic factor for asthma that persists after puberty[13], in the present study no relationship was detected between obesity in adolescence and asthma remission. It was shown that improvement of asthma in patients with no history of passive smoking was approximately 3.7 times more than the passive smoker's group. This significant inverse correlation between the remission of asthma and being in the passive smoking group was also reported previously.[7,10]. In mild intermittent cases who had no need to use ICS during the course of the disease, remission of asthma was seen significantly more than the other patients. It might be due to less inflammation and remodeling of the airways in these patients. The severity of asthma clearly lowers the rate of remission.[3, 9,17] Kupszyk et al. suggested the asthma severity as the strongest factor in long-term deterioration of lung function.[18] Some studies have reported that a sustained remission could occur in some subjects after discontinuation of long-term ICS therapy[19,20], while other reports revealed the reverse results.[21 22] The study of Covar et al. suggested that ICS may not influence lung function decline or the rate of decline in children. [23]

There is little evidence to suggest that ICS have remission inducing effects, although a minority of adults with asthma may have a sustained remission after long-term therapy.[3]

Based on this study, approximately 33% of asthmatic children at the age of 11-15 years showed remission, which is a moderate rate compared with other studies. The remission rate was positively correlated with age of onset, and inversely correlated with family history of asthma, atopic dermatitis, hospitalization due to asthma, passive smoking and the need to use inhaled corticosteroids.

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