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Asthma Control in Pediatric Patients at Taleghani Hospital, Gorgan, Iran

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ABSTRACT

Background and Objective: Asthma is the most common chronic disease in children and its prevalence has increased in the last three decades, so making the proper control of asthma is of great importance. The aim of this study was to evaluate asthma control in children in Gorgan, Iran.

Methods: In this cross-sectional study, 80 asthma patients in Taleghani Hospital, Gorgan, Iran (2019-2020) were studied in two groups; one controlled (n=46) and another one uncontrolled (n=34). The age range of the patients was 5-15 years. Data with a diagnosis of asthma were extracted from the medical records. The asthma control test (ACT) questionnaire was used to assess asthma control. A checklist was also prepared for this purpose.

Findings: Among the uncontrolled patients, 14 (31.10%) were female and 20 (57.10%) were male. A significant relationship was found between gender and disease control (P=0.02). Moreover, a positive association was found between asthma control and parents' asthma history (P=0.03 for father and P=0.05 for mother/father). The duration of asthma showed no significant differences between the controlled and uncontrolled groups. Disease severity also had a positive effect on poor asthma control (P=0.001), resulting in 52.90% of patients in the uncontrolled group having severe asthma.

Conclusion: The uncontrolled asthma seemed to be present in less than 50% of asthmatic children. Gender, parental history, and severity of asthma revealed a positive association with asthma control. The results could be useful to further overcome the problems of asthma control.

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Introduction

Asthma is a disease with chronic inflammation of the airways caused or aggravated in susceptible individuals (genetically) and also under the influence of environmental factors [1, 2]. In general, asthma is a syndrome involving various organs such as the immune, endocrine, and nervous systems [3]. Asthma is one of the most common chronic diseases and its prevalence is increasing in the world. According to a systemic review and meta-analysis by Rahimian et al. (2021), the prevalence of asthma in Iranian children and adolescents was 6% and 8%, respectively [4]. Despite recent advances in treatment, asthma is responsible for 2000000 emergency visits in the United States and is the third leading cause of hospitalization with approximately 500000 cases [5, 6]. According to recent studies, more than 30 % of emergency department visits, 30 % of activity limitations, and 50 % of sleep disorders are attributed to asthma [7].

Given developments in the pathophysiology of asthma, physicians now focus on controlling the disease rather than treating it. Recent guidelines describe asthma control as no limitation of physical activity, no nocturnal symptoms, no or few daily symptoms, no need for life-saving treatments, and normal lung function without exacerbations [8-10]. Identifying effective means to influence the growth and duration of asthma is important for healthcare providers caring for children with asthma. Environmental and biological factors that influence asthma are not yet known. The study of the severity of symptoms in individuals is a tool to identify environmental biological factors. Therefore, asthma control is regarded as a response of patients to therapeutic interventions [11]. In one study, patients with chronic asthma were divided into three groups based on their main symptoms: mild, moderate, and severe [12]. In the mild asthma group, the status of asthma control was very good. In this situation, inhaled sedatives or poorly controlled therapies such as low-dose inhaled corticosteroids (ICS) or leukotriene receptor antagonists were used as needed. In the moderate asthma group, asthma control was good and the disease was treated with low doses of ICS and LABA. In the severe asthma group, high doses of ICS/LABA were applied to prevent failure to control asthma despite these measures [13, 14].

In general, research on asthma control is essential due to the rising prevalence of asthma and socioeconomic burden on society and individuals [6, 9]. Therefore, the aim of this study was to evaluate asthma control status in 5- to 15- year-old children using the asthma control test (ACT).

Methods

Subjects and sampling

In this cross-sectional study' 80 patients with asthma were enrolled. The children aged 5-15 years who had been referred to asthma and allergy clinic of Taleghani Hospital in Gorgan, Iran, were then studied in 2019 and 2020. Early childhood risk factors for persistent asthma were explained as major (parental asthma, eczema, sensitization to inhalant allergens) and minor (allergic rhinitis, wheezing outside of colds, ≥4% peripheral blood eosinophils, sensitization to food allergens). Confirmation of asthma in patients was based on history, presence of clinical criteria and presence of allergy by skin prick test, lung function abnormalities and assessment of airway inflammation. In addition, spirometry with or without bronchodilator and mite sensitivity tests were performed. Inclusion criteria were confirmation of asthma by a specialist, age between 5 and 15 years, ability to speak Persian and lack of verbal, mental, visual and auditory problems. Exclusion criteria included patient demarcation, deficiencies in the patients' records, and a history of underlying diseases such as pulmonary, cardiac and severe blood diseases affecting patients' respiratory function independently of asthma. A demographic checklist was created that included general characteristics such as age, gender, as well as family history of asthma.

Asthma control test (ACT)

In the current study, the data of patients with asthma were excluded from the medical records of Taleghani Hospital. In order to assess asthma control Child-ACT (C-ACT) questionnaire was filled for 4-11 year old children and ACT questionnaire was used for children with age more

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than 11 years old. Filling the questionnaires was conducted by researchers or a trained assistant under the supervision of a specialist physician.

ACT questionnaire is an important tool to have in the records of asthma patients [15]. This questionnaire assessed daily symptoms, nocturnal symptoms, use of rapid-acting beta-agonists, limitation of daily activities and patients' assessment of control. Twice or fewer daily symptoms in a week showed patients' good control. Control was rated as poor if symptoms occurred more frequently. Nocturnal symptoms and activity limitations occurred in patients who did not have their asthma under proper control. If patients used salbutamol spray more than three times a week to control asthma exacerbations, they were classified in the uncontrolled group. In this questionnaire, 7 questions were answered based on the patients' medical records. The sum of the scores indicated the control level. Initially, 4 questions were scored from zero (very poor) to three (very good). The other 3 questions were scored from zero (not at all) to five (every day). A total score of less than 19 indicated poor asthma control [12, 16]. According to ACT scores, the level of asthma is defined as controlled asthma, 25 points; partially controlled asthma, 20-24 points; and uncontrolled asthma, < 19 points [17].

Severity of asthma

The severity of asthma was assessed according to the guideline [18] and divided into intermittent and persistent asthma (mild, moderate, and severe). Asthma treatment was based on the guideline [18].

Statistical analysis

Data were analyzed with SPSS 18.0 and reported as mean ± standard deviation (SD) and frequency. The Kolmogorov-Smirnov test was used to determine normality of the data. Between-group comparisons were made with the chi-square test and Fisher's exact test. All graphs were processed using Graph Pad prism 6.0. P <0.05 was considered statistically significant.

Results

Of the 80 asthma patients, 46 (57.5%) and 34 (42.5%) were in the controlled and uncontrolled groups, respectively. The mean age of all patients was 10.14±2.33 years with an age range of 6-14 years. The mean age of patients in the controlled group was 10.13±2.13 and in the uncontrolled group was 10.15±2.59 years. The mean age showed no significant statistical differences between the two groups (P=0.90). A total of 45 (56.20 %) cases were classified as male and 35 (43.80 %) others as female. The controlled and uncontrolled groups were assessed based on their gender (Table 1). According to the chi-square test, there was a statistically significant relationship between age and asthma control status (P=0.02).

The relationship between asthma control status and parental asthma history generally revealed that 12 (26.10 %) children in the controlled group had parents (at least one parent) with an asthma history. In contrast, there were 16 (47.10 %) in the uncontrolled group (Table 1). The mean duration of asthma was 4.15±1.78 and 4.62±2.03 years in the controlled and uncontrolled groups, respectively. There were no significant statistical differences between the two groups in the mean duration of asthma (P= 0.22). In the current study, the severity of asthma in patients was evaluated in relation to asthma control status. Based on the results, a significant relationship was found between disease severity and control status in asthma patients (<0.01) (Table 2).

Table 1. The frequency distribution of asthma patients in groups

Character			ACT		P-value
			Controlled-n (%)	Uncontrolled-n (%)	
Gender	Male		15 (42.90)	20 (57.10)	0.02
	Female		31(68.90)	14 (31.10)	
Parents' history of asthma	Mother	With asthma	5 (35.70)	9 (64.30)	0.07
		Without asthma	41(62.10)	25 (37.90)	
	Father	With asthma	7(50.00)	7 (50.00)	0.03
		Without asthma	39 (59.10)	27 (40.90)	
	Mother/father	With asthma	12 (26.10)	16 (47.10)	0.05
		Without asthma	34 (73.90)	18 (52.90)	

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Table 2. The frequency distribution of patients based on the severity of asthma in relation to control status

Severity of asthma	ACT		P-value
	Controlled-N (%)	Uncontrolled-N (%)	
Mild	12 (26.10)	7 (20.60)	<0.01
Moderate	28 (60.90)	9 (26.50)	
Severe	6 (13.00)	18 (52.90)	

Discussion

In the present study, asthma control status was evaluated in pediatric asthma patients. The results represented that 42.50 % of patients were in the uncontrolled group. Han et al. (2020) reported that 27.8 % of children from a hospital in a northern Chinese city had uncontrolled asthma status [19]. This frequency was however lower than that in our country. In another study by Doenges et al. in 2020, 40% of 55 German pediatric patients were in uncontrolled asthma status. The mean age of the patients was 41.0 ± 3.7 years [20] and was similar to our results. Moreover, in 2014, Sasaki et al. conducted a national web-based survey of asthma control status using C-ACT in Japanese children with asthma. The age range of these patients was 6-11 years. They found that 14.6 % of 3066 children with current asthma had uncontrolled asthma [21]. Banjari et al. (2018) also studied asthma control status in 106 pediatric patients with a mean age of 10.3 years. They reported 84% cases of uncontrolled asthma, [22] which was approximately twice our rate. Although the asthma control rate in this study was better than that of Banjari et al., it was also higher than the reports of asthma control in other populations in the world. Obviously, it is impossible to control all asthma symptoms. Although patients are often satisfied with asthma symptom control, nocturnal symptoms are unpredictable [20]. Furthermore, the number of studied cases as well as the mean age are reasons for our different results compared with most other studies. Hence, asthma control in more Iranian populations needs further investigation.

In the present study, uncontrolled status was lower in women than men (57.1 % of women versus 31.1 % of men), which was statistically significant. In a study by Gustafsson et al. (2018), the mean score of ACT was 12.5 in women and 16.4 in men, suggesting that control status is better in men [23]; thus, confirming the results of this study. Banjari et al. came to different results and found no significant relationship between gender and asthma. Lung function and asthma control can be affected by hormones in both men and women. Moreover, they found that hormones had a positive effect on asthma functions in men, while this hormonal effect was negative in women [24]. Thus, the results of the current study confirm the relationship between gender and asthma control. However, further studies based on larger populations are needed. In addition, the relationship between other factors such as hormones and asthma control needs to be evaluated.

Another notable point in the present study was the relationship between asthma control and parental asthma history. The results showed a significant relationship between asthma history in both fathers and mothers or fathers (P= 0.03 and P= 0.05, respectively). However, mothers' asthma history demonstrated no significant association with asthma control (P> 0.05). Konradsen et al. (2011) also found an association between asthma control and parental asthma history in a Swedish population [25]. Furthermore, Hallit et al. in 2017 revealed that parental asthma history had a significant positive association with poor asthma control in a Lebanese child population. Seemingly, this association can be attributed to two reasons. One is the genetic background of these asthmatic children. Another is the extreme attention given by parents with a history of asthma to their children, which leads to the onset and exacerbation of asthma in children due to immunological predisposition [26].

The relationship between severity and asthma control status was significantly positive (P= 0.01). Thus, increasing asthma severity increased the risk of uncontrolled asthma. Further, 52.90 % of patients with uncontrolled asthma had a severe form of the disease, while 60.90 % of children in the controlled group had moderate asthma. Yawn et al. in 2006

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confirmed that asthma severity is associated with uncontrolled asthma [27].

Limitations of the study

This study was t conducted only on patients with Persian language so that they could demonstrate and verbalize their symptoms; this could influence the degree of asthma control. The language of the patients and the sample size can be regarded as further limitations of the study.

Conclusion

The ongoing study investigated the degree of asthma control and some risk factors related to poor asthma control in Iranian children with asthma. The results showed that about half of the children had uncontrolled asthma. Gender, parental asthma history and asthma severity were factors that indicated a significant association with asthma control in our population. The results may help the health system to create appropriate conditions to improve asthma control.

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Ethical approval

The experimental steps and sampling were approved by the Research and Ethics Committee of Golestan University of Medical Sciences (IR.GOUMS.REC.1400.368). Patients or their parents completed and signed an informed consent form.

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Authors' contributions

ME and SAA designed and supervised the project. RRY performed all steps and collected and analyzed the data. AR wrote the article.

Conflict of interest

The authors have no relevant financial or nonfinancial interests to disclose.

Availability of data and materials

All data obtained or analyzed during this study are included in this article.

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