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Evaluating the Association between Gastroesophageal Reflux Disease (GERD) and Obesity and Asthma Severity in 6-18 Years of Old Patients Referring to the Allergy Clinic of Urmia University of Medical Sciences

Abstract

Asthma is a common disease in children with a prevalence of 7-10%. Asthmatic children are also affected by other underlying diseases. Management of this co-morbidity with asthma and another underlying disease is a unique challenge. The present study was carried out to evaluate the association between reflux and obesity and asthma severity in 6-18 years asthmatic children referring to the Allergy Clinic of Urmia University of Medical Sciences. In this cross-sectional study, the inclusion criteria included having an age between 6 and 18 years and asthma. The exclusion criteria included cystic fibrosis (CF), immunodeficiency, bronchiectasis, chronic lung diseases, cerebral palsy, and patient death in the study. Demographic information (age, gender, weight, height, body mass index, and residence) and information related to the records of other diseases including (rhinitis, sinusitis, and gastroesophageal reflux) were obtained through an information collection form. The mean age of 212 patients in the study was 8.4 years. The mean body mass index of the patients was 17.04 kg/m2. Among the patients, 11.8% were obese and 4.7% were overweight. No significant association was found between disease severity and obesity (P=0.44). The prevalence of reflux among the patients was 25.5%. There was no significant association between asthma severity and reflux (P=0.06). The results of the present study revealed no significant association between the presence of reflux and the severity of asthma. Also, the most common co-morbidities were reflux and obesity.

Keywords: *Asthma, Epidemiology, Reflux, Obesity, Children*

Mir Reza Ghaemi, *Associate professor, Allergist, and clinical Immunologist, Department of Pediatrics, Faculty of Medicine, Urmia university of medical sciences, Urmia, Iran*

Mohammad Radvar, *Associate professor, Pediatric Cardiologist, Department of Pediatrics, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran*
Correspondence: Mohammad Radvar, Tel
+98 914 341 0696
Gmail: mradvar15@gmail.com

Hamidreza Houshmand, *Associate professor, Allergist, and clinical Immunologist, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran*

Aida Ajdari, *Medical Doctor, Research Committee, Urmia University of Medical Sciences, Urmia Iran*

Introduction

Asthma is a common disease in children with a prevalence of 7-10%. It is also the fourth most common disease in adults with a prevalence of about 5% (1). In a study carried out in Iran in 2017, the prevalence of asthma was reported at 8.9% (2). Asthma with inflammation results in bronchial obstruction, swelling, and increased production of mucus in the airways. This disorder is more common in boys in the first decade of their life. However, after puberty and in the second decade of life, it seems that asthma is more common in young women, indicating that sex hormones can play a role in asthma (3).

Also, in many children, the severity of symptoms decreases with aging and may even disappear completely, especially in people with mild asthma. Also, symptoms may persist in children with severe asthma or relapse in early adulthood (4). Several conditions are observed in asthmatic patients and may affect asthma control and outcomes. Asthma is often associated with various diseases. The most common comorbidities of asthma include rhinitis, sinusitis, gastroesophageal reflux, mental disorders, chronic infections, obstructive sleep apnea, hormonal disorders, and depression disorders. When associated problems and comorbidities are diagnosed and treated in these patients, better asthma control may be achieved (5).

Obesity is also a growing health problem in children, but its association with asthma has not been clarified yet. Allergic rhinitis is a very common comorbidity of asthma in both children and adults, but its effect on asthma severity in children has not been investigated. It seems that food allergies cause more severe reactions in asthmatic patients. Depression disorders are more common in asthmatic children than in healthy children. Thus, there is a low level of knowledge about childhood asthma. In asthmatic children, there are disorders and diseases similar to adults. Although there is weak evidence of the effect of comorbidities on asthma in children, physicians should be aware of the high probability of comorbidities and diseases in asthmatic children (6).

Mirabelli et al carried out a study to determine the symptoms and complications of asthma in children and to compare the prevalence of selected complications in asthmatic children and healthy children. The results revealed that compared to children without asthma, asthmatic children had a higher prevalence of hay fever or respiratory allergy, eczema or skin allergy, sinusitis, food or digestive allergies, and problems in emotions, focus, and behavior (7). Safa et al carried out a study to evaluate the psychological characteristics and the correlation of demographic characteristics in asthmatic children to treat them better. The researchers stated that despite the high prevalence of depression in hospitalized asthmatic

children and the correlation of some demographic variables, they recommended evaluating their psychiatric status and treatment along with their asthma treatment and considering the serious mental problems in the treatment of asthmatic children (8).

Esmaeily et al. (2016) carried out a study to evaluate the association between asthma control self-efficacy and the quality of life of asthma patients in Iran. The results of this study revealed that self-efficacy is associated with better quality of life and control of asthma in control of symptoms (9). Dondi et al carried out a study to analyze the differences between age groups in terms of triggering and seasonal factors and identify people with a greater risk of disease exacerbation. They concluded that infections are the main trigger of acute asthma in children of any age and allergy is seen in school-age children following it. Attempts to better manage patients with chronic asthma may be made through individual action plans and possibly vaccination and allergen prevention measures (10). De Groot et al. conducted a study to investigate asthma comorbidities in childhood using the information obtained from the databases such as PubMed, Embase, and Cochrane on children aged 5 to 18 years. The incidence of allergic rhinitis with 60% to 80% in asthmatic children was higher than that of the normal population. The incidence of food allergy in asthmatic patients and healthy people is 33% to 21%, respectively.

A high body mass in children 1-2 years old has a significant relationship with the incidence of asthma at 3 years old (odds ratio = 1.4) and a high body mass in children 3 to 5 years old has a significant relationship with the incidence of asthma at 6 years old (odds ratio = 1.36). This relationship is more obvious in females. For example, in females who are obese or overweight at the age of 6 to 11 years, the odds of asthma symptoms are 7 times higher compared to the age of 11 to 13 years. Few studies have been carried out on the association between reflux and asthma. However, in one study, the incidence of reflux disease in asthmatic children was reported at 19.3% to 65%. Anxiety disorder or depression in asthmatic children is 16.3% to 8.6% compared to healthy children. In this study, the researchers concluded that physicians' knowledge of asthma comorbidities and active follow-up of patients is an important factors in better control of asthma (6). Most of the studies carried out in the area of asthma in children are limited to the age of 6 years, and little data is available regarding the ages of 6 to 18 years. This study was carried out to evaluate the comorbidities of asthma in patients aged 6 to 18 years to identify the factors and the associated problems that increase the morbidity in these patients and reduce the severity of this disease in asthmatic people by controlling or preventing these factors.

Materials and Methods

The present descriptive-analytical study was conducted on asthmatic children who were referred to the Allergy Clinic of Urmia University of Medical Sciences from November 2020 to November 2021. A convenient purposeful sampling method was used. Inclusion criteria included having an age of 6-18 years, asthma, and informed parental consent, and exclusion criteria included cystic fibrosis (CF), immunodeficiency, bronchiectasis, chronic lung diseases, cerebral palsy, and patient death during the study. The information was collected through an information collection form prepared by the researcher and under the supervision of the respected supervisor. These forms include information such as demographic characteristics and information related to the records of other diseases such as (rhinitis, sinusitis, and gastroesophageal reflux) according to the history obtained from the patient's parents and direct measurements by the researcher. A person's body mass index or BMI (weight in kg divided by the square of height in meters) was calculated. Finally, the data were analyzed in Spss-24 software and the frequency and relationship of each variable with asthma were measured and evaluated. Central and dispersion indices (mean and standard deviation) were calculated for quantitative variables, and frequency and percentage were calculated for qualitative variables. Statistical tables and charts are used to display data as needed. To analyze the data according to the analytical goals, the chi-square test, independent T-test, and logistic regression were used to examine the relationship between the variables. The analyses were performed in SPSS-24 software. Values less than 0.05 were considered significant.

Results

Demographic characteristics of the asthmatic patients

Based on the information in Table 1, the mean age, weight, height, and BMI of the studied children are 8.4 ± 2.12 years, 24.8 ± 11.1 kg, 117.8 ± 20.8 cm, and 17.04 ± 1.3 kg/m2, respectively.

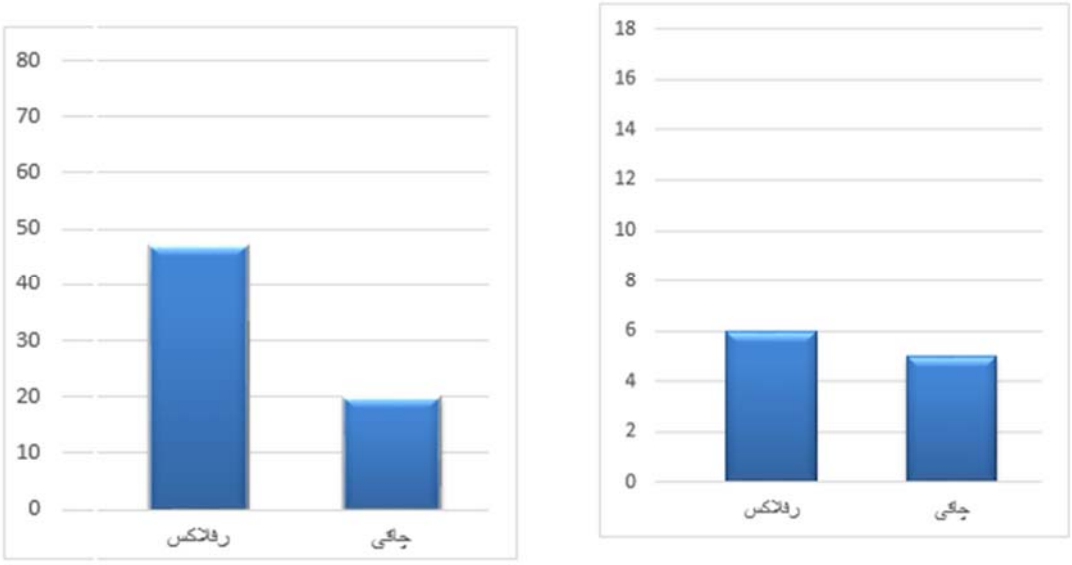
Table 1: Mean age, weight, height, and BMI of the studied children

	Mean±SD
Age	12.4 ± 2.8

Weight	1.8 ± 11.24
Height	8.8 ± 20.117
BMI	1.04 ± 3.17

Based on the information in Chart 1, in the age group of 6 to 11 years, 18 people (10.2%) had sinusitis, 67 people (38.1%,) had allergic rhinitis, 47 people (26.7%) had reflux and 20 people (11.4%) were obese. In the age group of 12 to 18 years, 2 people (5.9%) had sinusitis, 16 people (47.1%) had allergic rhinitis, 6 people (17.6%) had reflux, and 5 people (7 14%) were obese.

چاقیObesity:
رفلاکسreflux:



(A) ***(B)***

Chart 1: a) frequency of allergic rhinitis, sinusitis, reflux, and obesity in asthmatic children in the age group of 6-11 years, b) frequency of allergic rhinitis, sinusitis, reflux, and obesity in asthmatic children in the age group of 12-18 years

Evaluating the correlation of reflux (GERD) with asthma severity

Based on the information in Table 2, the chi-square test was used to evaluate the relationship between the severity of asthma and the presence or absence of reflux in the age groups 6-11 and 12-18. Based on the results of the test, there was no statistically significant difference between the severity of asthma and the presence of reflux in the age groups of 6-11 and 12-18 years.

Table 2- Relationship between reflux (GERD) and asthma severity in different age groups

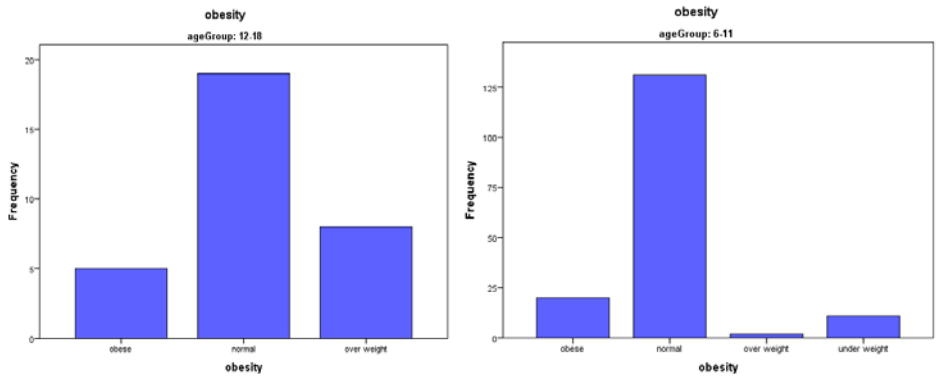
		reflux n (%)		P-Value
		yes	no	
6-11	Intermittent mild	(20) 12	(80) 48	22.0
	Stable mild	1) 18.(32	9) 38.(67	
	Stable moderate	5) 9.(22	5) 31.(77	
	Stable severe	(40) 8	(60) 12	

12-18	Intermittent mild	6) 2.(16	4) 10.(83	12.0
	Stable mild	(40) 4	(60) 6	
	Stable moderate	0) 1.(7	0) 13.(93	
	Stable severe	0	0	

Evaluating the prevalence of obesity and the relationship between obesity and asthma severity

In this study, 25 people (11.8%) were obese, and 10 people (4.7%) were overweight. Chart 2 shows the prevalence of overweight and obesity based on age group.

Based on the information in Table 3b, the Chi-square test was used to evaluate the relationship between asthma severity and obesity. Based on the results of the test, there was no statistically significant difference between the severity of asthma and obesity (p=0.44).



A ***B***

Chart 2- a) Prevalence of obesity and overweight in the studied population in the age group of 6-11, b) Prevalence of obesity and overweight in the study population in the age group of 12-18 years

Table 4- Relationship between asthma severity and obesity

		BMI				P-Value
		underweight	normal	overweight	obese	
asthma severity	Intermittent mild	2) 3.(4	6) 53.(73	2) 3.(4	5) 9.(12	44.0
	Stable mild	1) 4.(6	7) 48.(72	0) 2.(3	1) 6.(9	
	Stable moderate	-	2) 39.(72	3) 5.(9	8) 8.(14	
	Stable severe	-	0) 12.(60	0) 2.(10	0) 2.(10	

Based on the information in Table 5, the Chi-square test was used to evaluate the relationship between the severity of asthma and obesity among girls and boys. Based on the test results, there was no statistically significant difference between the severity of asthma and obesity among the boys and girls.

Table 5: Relationship between asthma severity and obesity in boys and girls

		BMI				P-Value
		underweight	normal	overweight	obese	
Boys	Intermittent mild	0	9) 40.(86	5) 3.(6	5) 3.(6	20.0
	Stable mild	8) 2.(5	2) 30.(88	8) 2.(5	0	
	Stable moderate	0	4) 27.(79	8) 2.(5	7) 5.(14	

	Stable severe	0	7) 12.(85	0	2) 2.(14	
Girls	Intermittent mild	8) 5.(20	1) 13.(54	0	0) 6.(25	12.0
	Stable mild	6) 2.(7	(69/2) 18	0	0) 6.(23	
	Stable moderate	0	6) 12.(66	6) 3.(16	6) 3.(16	
	Stable severe	(100) 2	0	0	0	

Discussion

Asthma is a chronic disease of the airways in which attacks of coughing, wheezing, shortness of breath, and pressure in the chest are repeated intermittently (11). Asthmatic children are also affected by other underlying diseases. Management of this comorbidity with asthma and another underlying disease is a unique challenge (6, 12). Identification and proper treatment of chronic diseases with asthma in children can result in the improvement of outcomes in these patients (13). The present study was carried out to evaluate the epidemiological characteristics and comorbidities in asthmatic children aged 6 to 18 years who were referred to the Allergy Clinic of Urmia University of Medical Sciences from 2020/10/22 to 2021/10/22. Based on the results of this study, the mean age of the subjects was 8.4 years and most of them were city residents and male. Several studies have been carried out to evaluate the epidemiological characteristics of asthmatic children. In the study carried out in Yazd, Golshan (2018) investigated the relationship between obesity and asthma in children, and similar to the results of our study, boys had a higher percentage of the population and the mean age of the patients was 8.64 years, which is close to the mean age of the patients in our study (15).

Also, the prevalence of reflux among these patients was 25.5%. The high severity of the disease was more in people with reflux than in people without reflux, but this difference was close to significant (P=0.06). In general, studies have shown that the prevalence of both reflux disease and asthma has increased in many countries in recent years (16-17) so that the estimated prevalence of asthma was 10% and the estimated prevalence of reflux was 20 to 40% in the general population (19, 18). Also, it is estimated that the prevalence of reflux in patients with asthma is 30 to 90% (21, 20). The results of the present study are also close to some reports. The reason for the high rate of reflux in asthmatic patients does not seem to be related to a simple possibility that indicates the relationship between the pathology of the two diseases (19). Longitudinal studies have found that reflux is a risk factor for asthma (22).

Moreover, the results of our study showed that 11.8% of the studied patients were obese and no correlation was observed between the severity of the disease and obesity. In some other studies, as in the present study, no significant relationship was found between obesity and asthma severity (23-24). Peters et al. (25) examined body mass index and asthma severity in 2018 and found no significant relationship between disease severity and obesity in children. Also, in the study conducted by Chinn et al. (26) in 2003, like the results of the present study, no significant association was found between obesity and asthma. However, some other studies, contrary to the results of the present study, showed that there is a strong association between obesity and the severity of asthma (28, 27). In the study conducted by Golshan et al. (15), unlike the results obtained in this study, obesity showed a significant association with severe asthma.

The lack of an association between obesity and asthma in our study can be attributed to factors such as poverty, malnutrition in children, or lack of referral of patients with obesity and asthma to allergy clinics. Also, the difference in the size of the samples, the effect of environmental and geographical factors, genetic factors, as well as the difference in the design of different studies may be the causes of the differences in these studies. Finally, the results of the present study revealed that the frequency of sinusitis in patients was 9.4%, and no significant relationship was found between people with and without sinusitis in terms of the severity of the disease. A limited number of studies have been carried out on the frequency of sinusitis in asthmatic children. Fuller et al. (29) 1994 found that 27% of patients referred to the hospital with severe asthma had abnormal radiological findings in the sinuses. The reason for the difference between the results of this study and those of our study can be the difference in the study population and also the use of imaging for the patients in the mentioned study. Moreover, Tosca et al. (30) also showed that 50% of children with treatment-resistant asthma had rhinosinusitis in the endoscopic examination.

Conclusion

The results of the present study did not reveal any significant relationship between the presence of comorbidities and the severity of asthma. Also, the most common comorbidities were reflux and obesity, respectively. Given the significant impact of asthma on the quality of life and the high burden of this disease on the treatment system, it is recommended to conduct more extensive studies on the factors affecting it and to evaluate the characteristics of the affected patients.

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