



Evaluation of Chest Radiographic Findings in Patients with Asthma Admitted to Taleghani Hospital in Gorgan, Iran

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ABSTRACT

Introduction: Asthma is a common reversible chronic respiratory disease that occurs in children and adults with several manifestations. Examining and recognizing the findings of simple chest X-rays in patients with asthma enables preventing complications and progression of the disease by diagnosing asthma or other possible disorders.

Materials and methods: This cross-sectional study was performed in 2018 on patients with asthma admitted to Taleghani Hospital in Gorgan, Iran. The data were collected from hospital records and chest X-ray reports of the patients.

Findings: Overall, 269 patients were recruited. The gender distribution of the participants was as follows: 110 (40.9%) female and 159 (59.1%) male. In this study, the mean age of patients was 4.85 years.

We found a significant relationship between chest pain and the presence of pneumothorax in the patients' graph ($P=0.001$).

Conclusion: The research findings indicated that the sex and age of the patient were not related to the graphic findings of patients. Most of the patients' complaints were coughs and shortness of breath, which were not related to the graphic findings of the patients. A significant relationship was found between patients reporting chest pain and pneumothorax in their chest X-rays. By studying and recognizing chest radiographic findings in patients with asthma, the complications and progression of the disease can be prevented.

Keywords: Pediatric asthma, lung disease and obstructive shortness of breath, chest radiography

INTRODUCTION

Asthma is a common reversible chronic respiratory disease in children and adults. It is manifested as increased sensitivity and response of the airways and chronic inflammation of the bronchi [1].

Inflammatory cells, chemical mediators, and chemotactic factors are involved in inflammation of the airways. This inflammation increases the response to allergens, leading to edema, increased mucus secretion in the lungs, and accumulation of inflammatory cells [2].

Asthma is the most common chronic disease of children in industrialized countries. The prevalence of this disease is in-

creasing. According to the study of Dr. Moein et al. (2007), the average nationwide prevalence of this disease in people under 18 was 14.13% [3].

The incidence of asthma in women is equal to men. In children, asthma is more common among boys. Symptoms include cough, wheezing, shortness of breath, chest pain, fever, and coryza symptoms [2]. Chest radiographs include bilateral pulmonary edema, flattening of the diaphragm, widening of the diaphragmatic angle, and silhouette signs. Radiographic evidence of atelectasis and pneumonia can also be seen upon the occurrence of asthma complications such as mucosal obstruction [4]. Chest radiography is an affordable and low-cost method compared to other imaging methods that can help diagnosis-

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tics and rule out anatomical abnormalities. Chest X-ray is used in the first asthma attack, recurrent cough or wheezing attacks with an unknown diagnosis, asthma with fever indicating pneumonia, or localized findings on examination [2].

MATERIALS AND METHODS

This cross-sectional study was performed in 2018. The participants were asthma patients admitted to Taleghani Hospital in Gorgan, Iran. The data were collected from patient records and chest X-ray reports. The inclusion criteria involved patients who were hospitalized with a diagnosis of asthma and had a chest X-ray.

The exclusion criteria involved patients who did not have a chest X-ray despite being admitted with a diagnosis of asthma.

Patients' chest radiographs were evaluated for radiological findings, including silhouette signs, hyperventilation, new pulmonary nodule, flat diaphragm, focal parenchymal lesion, and pulmonary vascular congestion.

In this study, chi-square test and t-test were used to compare the variables and p values less than 0.05 were considered significant.

RESULTS

A total of 269 patients were selected after applying the inclusion and exclusion criteria. Patients were evaluated by gender: 110 cases (40.9%) were female, and 159 cases (59.1%) were male.

In this study, the mean age of patients was 4.85 years. The age of patients ranged from infancy to 18 years: 2 cases of neonates (0.7%), 64 infants (23.8%), 134 early childhood (49.8%), 55 children (20.4%), and 14 adolescents (2.5%).

The frequency of patients' complaints included coughing (70 cases, 26%), respiratory distress (150 cases, 55.8%), coryza symptoms (33 cases, 12.3%), fever (9 cases, 3.3%), and chest pain (7 cases, 2.6%).

Chest radiographic findings in patients included: Signs of silhouette (10 cases, 3.7%), focal parenchymal lesion (11 cases, 4.1%), pulmonary vascular congestion (4 cases, 1.5%), new pulmonary nodules (1 case, 0.4%), pneumothorax (2 cases, 0.7%), hyperventilation (19 cases, 7.1%), and flat diaphragm (20 cases, 7.4%) (Tables 1-3).

Table 1: Frequency of chest radiographic findings in asthma patients based on age group

p-Value	Number (Percentage)					Age group
	Adolescent	Children	Early childhood	Infant	Neonates	
0.863	0 (0)	4 (7.3)	3 (2.2)	3 (4.7)	0 (0)	Silhouette sign
0.547	0 (0)	2 (3.6)	6 (4.5)	3 (4.7)	0 (0)	focal parenchymal lesion
0.892	0 (0)	1 (1.8)	2 (1.5)	1 (1.6)	0 (0)	pulmonary vascular congestion
0.2	0 (0)	0 (0)	0 (0)	1 (1.6)	0 (0)	new pulmonary nodules
0.444	0 (0)	1 (1.8)	1 (0.7)	0 (0)	0 (0)	pneumothorax
0.241	2 (14.3)	1 (1.8)	8 (6)	8 (12.5)	0 (0)	hyperventilation
0.38	2 (14.3)	2 (3.6)	8 (6)	8 (12.5)	0 (0)	flat diaphragm

Table 2: Frequency of chest radiographic findings in asthma patients by gender

p-Value	Number (Percentage)		Gender
	Male	Female	
0.152	8 (5)	2 (1.8)	Silhouette sign
0.337	8 (5)	3 (2.7)	focal parenchymal lesion
0.502	3 (1.9)	1 (0.9)	pulmonary vascular congestion
0.406	1 (0.6)	0 (0)	new pulmonary nodules
0.793	1 (0.6)	1 (0.9)	pneumothorax
0.631	10 (6.3)	9 (8.3)	hyperventilation
0.48	10 (6.3)	10 (9.1)	flat diaphragm

Table 3: Frequency of chest radiographic findings in asthma patients

based on chief complaint

p-Value	uett	uett	uett	uett	uett	Chief complaint
	Chest pain	Fever	Coryza symptoms	Respiratory distress	Cough	
0.277	0 (0)	0 (0)	3 (9.1)	7 (4.7)	0 (0)	Silhouette sign
0.274	0 (0)	0 (0)	2 (6.1)	4 (2.7)	5 (7.1)	focal parenchymal lesion

0.986	0 (0)	0 (0)	1 (3)	2 (1.3)	1 (1.4)	pulmonary vascular congestion
0.252	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	new pulmonary nodules
0.001	2 (28.6)	0 (0)	0 (0)	0 (0)	0 (0)	pneumothorax
0.29	2 (28.6)	0 (0)	4 (12.1)	7 (4.7)	6 (8.6)	hyperventilation
0.303	2 (28.6)	0 (0)	4 (12.1)	8 (5.3)	6 (8.6)	flat diaphragm

DISCUSSION

The study results indicated that the highest prevalence was in the range of 2 to 6 years, in line with the study of Narayanan et al. (2014) and Halaby et al. (2014). These two studies reported that the estimated average age of children with asthma was six years old [5,6].

In our study, the highest incidence of disease was 59.1% in males and 40.9% in females, in line with studies by Hoosen et al. (2020) reporting 61.5% incidence in males and Atapattu et al. (2017) reporting 51.8% incidence in males [7,8].

In the findings of our study, most of the patients' complaints were respiratory distress (55.8%) and cough (26%), Coryza symptoms (12.3%), fever (3.3%), and chest pain (2.6%). Hoosen et al. (2020) reported that 97% of patients presented with respiratory distress and 87% with cough [7]. Hedorse et al. (2004) stated that 95% of patients with abnormal chest X-rays related to asthma attacks complained about shortness of breath and coughs [9].

Narayanan et al. (2014) reported symptoms such as respiratory distress and fever, and chest pain in 10% of patients with positive pulmonary involvement [5].

Dours et al. (2020) found that shortness of breath occurred in 64% of patients on inhaled corticosteroids and 10% of patients without a history of inhaled corticosteroids [10].

In the present study, 75.1% of patients' chest X-rays showed no abnormal findings, and 24.9% of the chest X-rays contained abnormal findings, including hyperventilation (7%), flat diaphragm (7%), and focal parenchymal lesions. (4.1%) silhouette signs (3.7%), pulmonary vascular congestion (1.5%), Pneumothorax (0.7%), and new pulmonary nodule (0.4%). These findings agreed with which were studied with the findings of the following studies:

Hoosen et al. (2020) studied 39 patients, among whom 73.3% of radiographs were normal [7].

Atapattu et al. (2017) examined 108 patients and reported that 59.1% had normal patient radiographs. Abnormal findings included: Consolidation (15.7%), hyperventilation (8.7%), atelectasis (2.5%), pulmonary congestion (3.5%), and symptoms of pulmonary obstruction (6.1%) [8].

Halaby et al. (2014) studied 23 patients and found that 23.5% had abnormal graphics, 14% consolidation, 5.5% pneumotho-

rax, and 4% pneumomediastinum [6]. Hedorse et al. (2004) investigated 60 patients. They reported that 94% of patients with a first asthma attack and 80% of patients with a subsequent asthma attack had normal graphs. The highest abnormalities were seen in patients with hyperventilation, consolidation, and atelectasis [9].

Narayanan et al. (2014) examined 180 patients and reported that 10% of the graphs showed evidence of involvement, including atelectasis, hyperventilation, and pneumothorax [5].

Dours et al. (2020) studied 65 patients and reported the most common abnormal graph findings, including 85% consolidation, 2% bola, and 2% atelectasis [10].

Majerus et al. (2018) examined 184 patients, among whom about 40% had chest pain, and about 11% had pulmonary involvement on chest X-rays, including evidence of airway disease (52.7%), bronchiolitis (2.2%), pneumonia (8.7%), pneumomediastinum (1.6%), and pneumothorax (1.1%) [11].

In the study by White et al., 34% of patients with asthma had abnormal radiographic findings [12].

Also, Nantanda et al. (2020) report that in 41% of patients referred with asthma attacks due to bacterial or viral lung diseases, the need for a chest X-ray in asthmatic patient's increases. Chest X-ray has also changed the treatment approach of these patients [13].

In our study, 2.6% of patients presented with chest pain complaints that there was a significant relationship between these patients and the incidence of pneumothorax in their graph. (P-Value=0.001).

This finding is based on a study by Henglin et al. in 2020 on 333,657 patients and the result that the incidence of pneumothorax is high in patients with asthma, especially in people with uncontrolled asthma and under six years of age [14].

CONCLUSION

The results indicated that the highest prevalence of the disease was in males, with a peak incidence of 2 to 6 years of age. The patient's gender and age were unrelated to the patients' graphic findings. Patients' most complaints were coughing and shortness of breath, which had nothing to do with the patients' graphic findings. A significant relationship was found between patients reporting chest pain and pneumothorax in their chest X-rays (P-Value=0.001).

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None

CONFLICT OF INTEREST

Authors declare no conflict of interest

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