

## PHARMACOTHERAPY OF AN ALLERGIC ASTHMA PATIENT; A CASE STUDY

Nabeel Akhtar, Arslan Ghafar, Ijaz Ali, H. Junaid Shoukat, Sanaullah

Faculty of Pharmacy, University of Sargodha, Sargodha, Pakistan.

[\\*nabeelpharma40@gmail.com](mailto:*nabeelpharma40@gmail.com)

### Abstract

This case study has been designed to report an incident of asthma attack in a 70 years old man, brought to a local hospital in Gujranwala, who had three to four months asthma history, and he describes the seriousness of symptoms that are to be associated with his asthma attack. Complete chronological history of patient is taken including his past medication history by direct interview of his son. His spirometry test, allergen test, CT scan of sinuses, and chest X-rays are taken for complete diagnosis. These test studies have revealed that he has atopic asthma which often aggravates in the presence of allergen particles. He was hospitalized for three day and treated properly and then discharged. Symptoms resolved and patient was given prescription for steroids to be used with current home meds and instruction was also given for use of medications and to follow asthma action plan.

Key words: Asthmatic patient, Atopic asthma diagnosed, Asthma action plan.

## Introduction

Asthma is characterized by fluctuating airways obstruction, with diurnal variation and nocturnal exacerbations. This manifests as the triad of wheeze, cough and breathlessness. These symptoms are due to a combination of constriction of bronchial smooth muscle, oedema of the mucosa lining the small bronchi, and plugging of the bronchial lumen with viscous mucus and inflammatory cells. Asthma is broadly categorized into non-allergic and allergic, but there is considerable overlap. [1] In allergic asthma, which is usually of early onset, extrinsic allergens produce a type I allergic reaction in atopic subjects. Type I reactions are triggered via antibodies (IgE) on the surface of mast cells and other immune cells, especially activated Th2 lymphocytes, which release cytokines that recruit eosinophils and promote further IgE synthesis and sensitivity. Patients with non-allergic (late-onset) asthma do not appear to be sensitive to any single well-defined antigen, although infection (usually viral) often precipitates an attack. Inflammatory mediators implicated in asthma include histamine, several leukotrienes (LTC<sub>4</sub>/D<sub>4</sub> and E<sub>4</sub>) 5-hydroxytryptamine (serotonin), prostaglandin D<sub>2</sub>, platelet-activating factor (PAF), neuropeptides and tachykinins. Increased parasympathetic tone due to local and centrally mediated stimuli also promotes bronchoconstriction. [2]

Experts are not sure why some people develop asthma. Many factors may be involved, one of which is heredity. Some doctors believe that the airways become oversensitive because of damage to the cells caused by a viral infection such as a cold or flu.[3] Others believe that the initial damage is caused by an allergic reaction causing the lungs to overreact to viral infections. [4] It appears that genetic predisposition interacts with environmental factors to trigger the onset of the disease. [5] Environmental factors that seem to increase the risk of developing asthma include being exposed to cigarette smoke early in life, exposure to pet dander early in life, and certain types of infection early in life. [6]

Asthma remains the number one chronic disease of childhood with 12.8 million school days missed. The toll of asthma includes 1.7 million emergency department visits, 10.6 million physician office visits, 444,000 hospitalizations and 3,613 deaths. [7] The United States has seen declining asthma death

rates despite increased prevalence. Fewer patients who have asthma report limitation to activities. Twenty-three million Americans, one out of every 13 people, have this chronic inflammatory lung disease that if uncontrolled can lead to suffering with cough, wheezing and shortness of breath. Approximately 50% of asthma patients report having had an attack within one year, and they suffer a larger volume of missed school and work. Of all asthma patients, more than 13% suffer asthma attacks that require urgent medical care. The Centres for Disease Control identified its priority to be patients improving management of asthma symptoms. [8]

## Case presentation

The patient a 70 y/o man, with three to four months of asthma history, named M.Sabir s/o Rehmat Ali. He lives in a village Adil Garh near Ghakhar Mandi and he works in a rice mill as a security guard from last 7 years. Two months ago he came to know that he had asthma due to allergen particles. He had taken her prescribed medications of Cromolyn Sodium and Ventoline prescribed by his previous doctor for last two months but due to his carelessness in taking medicine properly and air pollution in his home town and work place he aggravates his asthma again. Moreover he also has muscle and joints pain due to deficiency of calcium.

He was brought to Civil Hospital Gujranwala with tachypnea, and acute shortness of breath with audible wheezing. He had taken her prescribed medications of Cromolyn Sodium and Ventoline prescribed by his previous doctor at home with no relief of symptoms prior to coming to the hospital. The patient also told that often, he had irregular cough attacks for last two to three months. Often he feels a tight feeling in the chest. The doctor examined the patient's nose, throat and upper airways. He used a stethoscope to listen to his breathing. Wheezing — high-pitched whistling sounds when he breathe out, is one of the main signs of asthma.

Then the doctor examined his skin for signs of allergic conditions such as eczema and hives. And ask whether he had common signs and symptoms of asthma, such as: Recurrent wheezing, Coughing, Trouble breathing, Chest tightness, Symptoms that occur or worsen at night, Symptoms that are triggered by cold air, exercise or exposure to allergens. The patient confirmed these symptoms.

A physical exam revealed the following: HR 110, RR

40 with signs of accessory muscle use. Auscultation revealed decreased breath sounds with inspiratory and expiratory wheezing. Saturation of O<sub>2</sub> was 90% on room air. An arterial blood gas (ABG) was ordered with the following results: pH 7.45, Partial pressure of CO<sub>2</sub> 27, Partial pressure of O<sub>2</sub> 75.

The doctor recommended following diagnostic test for further confirmation of disease

### **Spirometry**

For diagnosing asthma breathing tests, to measure how well your lungs are working, is necessary. One of these tests is called spirometry. In this test the patient take a deep breath and blow into a sensor to measure the amount of air his lungs can hold and the speed of the air he inhale or exhale. This test diagnoses asthma severity and measures how well treatment is working. [9]

Spirometry result: Table1 shows the spirometry results in this case. Spirometry reveals pre-bronchodilator FEV<sub>1</sub> /FVC ratio that is obstructive at 0.57.

### **Evaluation of the Sinuses**

The presence of nasal polyps or sinusitis may make asthma harder to treat and control. Sinusitis, also called sinus infection, is an inflammation or swelling of the sinuses due to infection. When the sinuses become blocked and filled with fluid, bacteria grow, causing infection and inflammation. Doctor may order a special sinus X-ray, called a CT scan, to evaluate your sinuses if he suspects an infection. [10]

Of note is that there is air contained in the middle turbinate on the left (C-short for concha bullosa). This represents a normal anatomical variant in which the ethmoid sinuses have pushed down into the middle turbinate. In this case, it does not appear to have caused a problem, but often it will cause a significant enlargement of the middle turbinate and consequently an obstruction on one side of the nose.

Result: Sinuses are normal. Fig 1

### **Allergy Testing**

Asthma and allergies often go hand-in-hand. Allergic asthma is a type of asthma that is triggered by an allergen (for example, pollen or mold spores). According to the American Academy of Allergy, Asthma and Immunology, half of the 20 million Americans with asthma have allergic asthma.

So, allergy test is recommended to the patient for treating the underlying allergic triggers for his asthma that will help him to avoid asthma symptoms. This is a method for determining to what substances a person is allergic. [11]

Result: In present case, allergen test shows that patient is allergic to Tobacco Smoke, Dust Mites Outdoor, Air Pollution, Cockroach Allergen, Pets Hair, Mold, spores, Smoke from Burning Wood or Grass, Other Triggers.

### **Chest X-Ray**

A chest X-ray is not an asthma test, it may be used to make sure nothing else is causing the patient's asthma symptoms. X-rays can be used to diagnose a wide range of conditions, from bronchitis to a broken bone. By viewing patient's lungs, his doctor can see if asthma is likely to be causing his symptoms. The doctor often obtains a chest X-ray on an initial visit to make sure there is no infection or another problem in the lungs. He will also look for signs of hyperinflation of the lungs, which can be a symptom of severe asthma. [12]

Result/Interpretation of chest X-ray:

In the present case chest radiography is revealing complications or alternative causes of wheezing and its exacerbations. Moreover bronchial thickening, hyperinflation, and focal atelectasis suggest asthma or may be chronic bronchitis

### **Interpretation of diagnostic tests and pharmacotherapy**

Spirometry test and bronchial thickening, hyperinflation, and focal atelectasis shown in chest X-ray suggest acute asthma attack. While allergen tests reveal the detail of triggers that aggravates asthma. Due to severeness of the disease, the patient is hospitalized and has given following medication.

He is nebulised with Clenil A and ventoline solution for first two days, thrice a day. A nebulizer used for this purpose. Table 2, Table 3

There is no cure for asthma, but symptoms can be controlled with effective asthma treatment and management. This involves taking medications as directed and learning to avoid triggers that cause asthma symptoms. Relatives of patient with asthma are taught to recognize symptoms that indicate poor asthma control and the need for additional therapy. Asthma Action Plan is an important tool that can help manage the care of patient with asthma. [13]

**Asthma action plan**

Peak Flow Meter is prescribed to patient. Peak Flow Meters are usually used with a written action plan. This plan guides the patient on how to manage his asthma. Patient with increasing asthma symptoms or decreased peak flow measurements need attention. Patient is advised to follow the steps prescribed by the Patient's health care provider in his or her asthma action plan on any change in peak flow measurements.

**Asthma Action Plan**

Green zone:

1. Doing Well
2. No coughing, wheezing, chest tightness, or difficulty breathing
3. Can work, play, exercise, perform usual activities without symptoms
4. Peak flow \_\_\_\_ to \_\_\_\_ (80% to 100% of personal best)
5. Take these medicines every day for control and maintenance:

Table 4

Yellow zone:

Caution/Getting Worse

1. Coughing, wheezing, chest Tightness or difficulty breathing
2. Symptoms with daily activities, work, play, and exercise
3. Night time awakenings with Symptoms  
OR
4. Peak flow \_ to \_ (50% to 80%of personal best)  
Continue your Green Zone medicines PLUS take these quick-relief medicines

Table 5

**Call your doctor if you have been in the Yellow Zone for more than 24 hours**

Red zone:

Caution/Getting Worse

1. Difficulty breathing, Coughing, wheezing not helped with medications
2. Trouble walking or talking due to asthma symptoms
3. Not responding to quick relief Medication  
OR
4. Peak flow is less than Take these quick-relief medicines \_\_ (50% of personal best)

Table 7

CALL your doctor NOW:

GO to the hospital/emergency department or CALL for an ambulance NOW!

**Discussion**

For the diagnosis of asthma, the medical history including standard questions designed to identify the triggers that seem to exacerbate asthma symptoms. When modifiable elements that exacerbate symptoms are found, the patient needs appropriate attention in order to decrease exposures that lead to a decline in health. [14] There is no cure for asthma, but symptoms can be controlled with effective asthma treatment and management. This involves taking medications as directed and learning to avoid triggers that cause asthma symptoms. Relatives of patient with asthma are taught to recognize symptoms that indicate poor asthma control and the need for additional therapy. Asthma Action Plan is an important tool that can help manage the care of patient with asthma. Written asthma action plans guide the patient in decision making so that he become more confident and proficient in self management strategies. [15]

The reason for the increasing morbidity and mortality seen with asthma is not clear. But, many asthma related hospitalizations and deaths are preventable, and occur after certain "missteps" occur. For example, the patient may fail to avoid environmental triggers that make asthma more worsen. So, by recognizing early signs of worsen asthma, and taking appropriate medication, or getting prompt medical help, a patient can control his asthma. [16]

**Conclusion**

Effective care of asthma requires comprehensive assessment, appropriate diagnosis using current criteria, development and implementation of a written plan of care, and evaluation of the patient's response to treatment. As asthma increases in prevalence and there are multiple factors including genetics, environmental triggers, and allergens that contribute to symptom severity. Clinicians must maintain a high level of awareness in order to detect asthma and initiate treatment early to preserve patient's overall quality of life while preventing morbidity and mortality.

**Recommendations**

1. Physicians must obtain an appropriate patient and family history to assist them in recognizing

- the heterogeneity of wheezing phenotypes in preschool-aged children.
2. The presence of atopy should be determined because it is a predictor of persistent asthma.
  3. Health care professionals should continue to recommend the avoidance of tobacco smoke in the environment.
  4. For patients sensitized to house dust mites, physicians should encourage appropriate environmental control.
  5. Allergens to which a person is sensitized should be identified and a systematic program to eliminate, or at least to substantially reduce, allergen exposure in sensitized people should be undertaken.
  6. Physicians must carefully monitor patient with intermittent symptoms to ensure that they do not develop chronic symptoms requiring maintenance therapy.
  7. Physicians should consider injection immunotherapy using appropriate allergens for the treatment of allergic asthma only when the allergic component is well documented.
  8. Physicians should not recommend the use of injection immunotherapy in place of avoidance of environmental allergens.
  9. Physicians may consider injection immunotherapy in addition to appropriate environmental control and pharmacotherapy when asthma control remains inadequate.
  10. Immunotherapy is not recommended when asthma is unstable.
  11. Education is an essential component of asthma therapy and should be offered to all patients; educational interventions may be of particular benefit in patients with high asthma-related morbidity or severe asthma and at the time of emergency department visits and admissions to hospital. Education programs should be evaluated.
  12. All patients should monitor their asthma using symptoms or peak expiratory flow (PEF) measurement (level I) and have written action plans for self-management that include medication adjustment in response to severity or frequency of symptoms, the need for symptom relief medication or a change in PEF.
  13. Asthma control criteria should be assessed at each visit. Measurement of pulmonary function,

preferably by spirometry, should be done regularly in adults and children 6 years of age and older.

14. Socioeconomic and cultural factors should be taken into account in designing asthma education programs.

### Acknowledgement

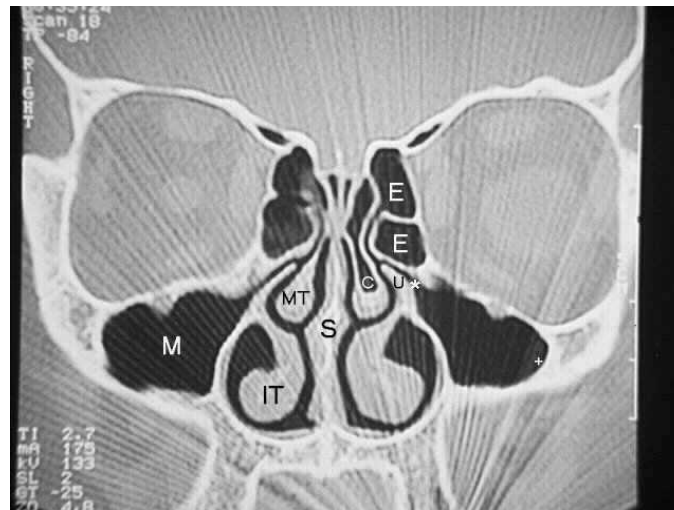
The author wishes to acknowledge Dr. Taha Nazir (B.Pharm, M.Phil, and PhD) Course Director: Microbiology & immunology. Faculty of Pharmacy, University of Sargodha, Sargodha

### Reference

1. Doherty DE. The pathophysiology of airway dys-function. Am J Med. 2004; 117(12A):11S-23S.
2. A-Textbook-of-Clinical-Pharmacology-and-Therapeutics-5th-edition.
3. Tinkelman DG, Price DB, Nordyke RJ, et al. Symptom-based questionnaire for differentiating COPD and asthma. Respiration. 2006; 73 (3):296-305.
4. Viral-Induce Asthma. Viruses can induce asthma by Anna Loengard, MD March 04,2008 <http://asthma.about.com/lw/Health-Medicine/Conditions-and-diseases/Viruses-Can-Trigger-Asthma-Symptoms.htm>
5. Sandford A, Weir T, Pare P. The genetics of asthma. Am J Respir Crit Care Med. 1996; 153:1749–1765.
6. Asthma health center Allergic asthma. <http://www.webmd.com/asthma/guide/allergic-asthma>
7. National Asthma Control Initiative, 2010.
8. Centers for Disease Control, 2011.
9. Petty TL. Spirometry made simple. National Lung Health Education Program Web site. <http://www.nlhep.org/resources/SpirometryMadeSimple.htm>. Published January 1999. Accessed October 1, 2008
10. The Asthma center. Asthma and sinuse disease. [http://www.theasthmacenter.org/index.php/disease\\_information/sinusitis/related\\_conditions/asthma\\_and\\_sinuse\\_disease/](http://www.theasthmacenter.org/index.php/disease_information/sinusitis/related_conditions/asthma_and_sinuse_disease/)
11. The Asthma Centre/ Allergic Disease Associates. <http://www.asthmacenter.com>
12. Asthma health center. Asthma tests. <http://www.webmd.com/asthma/guide/diagnosing-asthma-tests>
13. Center of disease control and prevention. Asthma Action Plan. <http://www.cdc.gov/asthma/actionplan.html>
14. Braman SS, Corrao WM. Chronic cough: diagnosis and treatment. Prim Care 1985; 12 (2):217-25.
15. Guidelines for the Diagnosis and Management of Asthma - National Heart, Lung, and Blood Institute, National Asthma Education Program, Expert Panel Report 3, 2007. Latest Updateand NHLBI Asthma Site.
16. National Health and Medical Research Council 1988, Strategies for reducing morbidity and mortality of asthma, Report of the NHMRC Working Party on Asthma Associated Deaths, Canberra.

	Pre-bronchodilator (%predicted)	Normal Range% (predicted)
FEV1 (L)	2.6 (64%)	80-120 (4.21)
FVC (L)	4.56 (90%)	80-120 (5.08)
FEV1 /FVC	0.57	0.80

**Table1:** spirometry results. FEV = Force expiratory volume (L) in one sec, FVC= Force vital capacity (L)



**Fig1:** CT-Scan of sinuses showing normal sinuses

LEGEND: + - border of maxillary sinus, \* - maxillary sinus ostium, U - uncinate process, E - ethmoid sinuses, IT- inferior turbinate, MT- middle turbinate, S - septum, C - concha bullosa.



**Fig 2:** Chest X-ray of our patient

**Table2:** Initial recommendation ( In present case)

Medication	Duration	Dosage	Interval
Cap. Azomax (250mg)	first three days	1 cap.	Twice daily
Syp.Brophyl (120ml)	First three days	2 teaspoon	Thrice a day
Montiget (Montelukast 10mg)	First three days	1 Tablet	Once a day
Tab.Antial	First three days	1 Tablet	Once a day
Tab.Britanyl (2.5mg)	First three days	1 Tablet	Thrice a day
Qilsan D	First three days	1 Tablet	twice daily

**Table3:** After three days(In present case)

Medication	Duration	Dosage	Interval
Cap. Azomax (250mg)	Two weeks	1 cap.	Twice daily
Montiget (Montelukast 10mg)	First three days	1 Tablet	Once a day
Tab.Antial (4mg)	Two weeks	1 Tablet	twice daily
Foracort HFA 200 (Inhaler)	Two weeks	1-2 spray	Twice daily
Tab.Aria (15mg)	Two weeks	1 tablet	Twice daily
Qilsan D	Two weeks	1 tablet	Twice daily

**Table4:** In green zone(for asthma action plan)

Medicine	Dosage	Interval
Tab.Aria (15mg)	1 tablet	Twice a day
Montiget (Montelukast 10mg)	1 Tablet	Once a day
Tab.Britanyl (2.5mg)	1 Tablet	Twice a day
Tab.Antial (8mg)	1 Tablet	Twice a day

**Table5:** In yellow zone ( for asthma action plan)

Medicine	Dosage	Interval
Ventoline (4mg)	1 tablet	Thrice a day
Foracort HFA 200 (Inhaler)	2 spray	Twice a day
Aeromax (Montelukast10 mg)	1 tablet	2 hour before exercise

**Table6:** In red zone(for asthma action plan)

Medicine	Dosage	Interval
Asthalin (Inhaler)	2 spray	At emergency