

# Bronchial asthma: case study presentation



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**1. Abstract:**

Introduction: Bronchial Asthma as a chronic and non -stable disease needs more attention to control the symptoms and to prevent exacerbations.

Asthma exacerbation can be triggered by different factors. Each patient has a different cause of exacerbations, and different management plan that must be tailored according to his medical history and triggering environmental factors around him

Objectives: In this case, we will study peak flow meter as a tool in management of asthma. In addition, we will study the role inhalant allergens in asthma exacerbations and scrutinize the available therapeutic options. We will apply diagnosis and treatment guidelines in the clinical setting, with stress on managing the patient's symptoms.

Case presentation: A 30 years old female patient came to the adult allergy and respiratory outpatient clinic presented with breathlessness, and cough. She had a history of allergic rhinitis. She was on regular medication on short acting beta agonist, budesonide inhalers and regular use of intranasal corticosteroids and oral antihistamines. According to national and ARIA guidelines, the patient had diagnosed and treated as exacerbation of allergic asthma and perennial allergic rhinitis.

**Conclusion:**

Exacerbation is one of the most serious problem facing asthmatic patients. Dust mite has a role as triggering the exacerbations in atopic patients. A written management plan should be given to the patient including

instructions related to his medications, peak flow meter usage and how to use inhalers.

## **2. Introduction and objectives:**

Bronchial asthma is an unstable disease and the changeableness of exacerbations which causes the main problem for patients. Asthma exacerbations have been clinical and economic importance. Asthma exacerbation is describing the decreasing changes in PEF or the need to oral corticosteroids. These changes followed by rapid changes over 2-3 days. These changes can be measured and confirmed by handheld Peak Flow Meter (PFM) instruments or spirometry. These measures interpreting the severity of the exacerbations that could be managed at home if are mild or moderate. However, the management should be at the hospital in case of severe exacerbations (Tattersfield, Postma, Barnes, et al, 1999)

Exacerbations can be initiated by viral or bacterial infection(Busse, Lemanske & Gern, 2010; Gern, 2008; Guilbert & Denlinger, 2010; Rosenthal, Avila, Heymann, et al, 2010; Spahn & Covar, 2008; Winther, 2011)

Mostly children and adult have the same ways in diagnosis and management; however, patients under the regular inhaled corticosteroids have a lower risk of attacks than who are not under ICS treatment. Even though, patients under proper control of asthma they might have an attack of exacerbations when they have clinical respiratory infections. Clinicians might fail to detect significant changes during an exacerbation in lung function because of an unpredicted consistent diurnal variability, which is a valuable marker of poor asthma control. These factors could lead to wrong management (Camargo, Rachelefsky & Schatz, 2009)

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**Literature review:**

Method of research; a literature search was done on Cochrane library, Centre evidence-base medicine, web of science and MEDLINE databases. The search done by using the search titles: Guidelines of asthma exacerbation management in adults, peak flow meter, pulmonary function tests, skin prick tests and inhalants allergens.

The research outcome; out of a total of 594 publications identified, 36 papers selected which published in primer Journals.

- 288 papers excluded because of no relevance to asthma exacerbations
- 189 papers were duplicated.
- 60 were not in English Language.
- 21 related to non-Human.

**3. Description of the case report/case presentation****Case home:**

A woman of 30 years old patient came to adult allergy and respiratory outpatient clinic presented with breathlessness, and cough. She had a history of allergic rhinitis.

**History of present illness:**

The patient came to adult respiratory outpatient clinic presented with breathlessness, and cough. In the last 2 months, patient has complained from breathlessness on exertion. His peak flow measurements varied between 150 to 400. In addition, the patient moved to an old building of his company accommodation. She is complaining from allergic rhinitis symptoms such as runny, blocked, itchy nose and snoring at sleep.

**Medical history:**

The patient was diagnosed with mild persistent asthma and allergic rhinitis since the age of 6 years. By at age of 12, the asthma symptoms almost disappeared except some of cough and wheezing when he got flu. In the last 2 years, the patient under medication of inhaled salbutamol 100mcg three times a day and budesonide 250 mg inhaler twice a day. His peak flow had remained constant around 400 prior the last two months. He was not regularly using antihistamines and nasal corticosteroids for rhinitis symptoms.

**Assessment:**

On examination, she appeared unperturbed at rest, speaking in complete sentences with a respiratory rate of 15/min. blood pressure is 120/80 oxygen saturations of 98%. Her weight is 95 Kg and her height is 166 CM  
Auscultation of the chest shown bilateral expiratory polyphonic wheeze with vesicular breath sounds. There were no other abnormal findings on examination. Temperature was 95 F. Peak flow in the clinic was 350l/min and on room air. The chest x ray was normal, CBC was normal and total IgE was 450 IU with the normal reference (hospital lap) is 87 IU. Patient sent to do skin prick test for inhalants allergens; dust mite, grass pollens mix (12 grasses) and moulds.

Skin prick result: (used in the test standardized allergens of stallergenes cooperation)

- Histamine Control > 5 mm
- Negative Temonin < 1 mm
- These results indicate the validity of the test.

- Positive for Dust mite > 5mm
- Negative for both moulds and grasses < 2 mm

This positive dust mite result matched with the patient clinical history of breathlessness symptoms and cough since she had moved to an old accommodation in the last two months.

### **Diagnosis:**

According to the US national guidelines (Camargo, Rachelefsky & Schatz, 2009) the patient had a mild exacerbation of asthma because his PEF value is 350 which dropped below 80 % of the predicted value which was 400. In addition, to the patient was skin prick positive to dust mite and according to Allergic rhinitis and its impacts on asthma (ARIA) guidelines the patient had chronic perennial allergic rhinitis with symptoms of regular nose booking and runny nose and still under treatment of intranasal corticosteroids and oral antihistamines. (Bousquet, Khaltaev, Cruz, et al, 2008)

## **4. Treatment**

### **Medical treatment**

According to the Global Initiative for Asthma (GINA) guidelines, treatment of asthma exacerbations by increasing the dose of short action Beta 2 agonist (salbutamol) and give a combinations of a long acting beta agonist twice a day and budesonide 250 mcg twice a day In addition, we could add antilukotrines modifier (monteukast 10mg once a day) because it has a valuable role for decreasing asthma exacerbations. We could advice the patient to start desensitisation by immunotherapy for dust mite allergy Immunotherapy is now a well-established treatment of allergic rhinitis and asthma (Salberg, 2008) In addition to regular intranasal corticosteroids and

oral antihistamines as ARIA Guidelines have recommended (Bousquet, Khaltaev, Cruz, et al, 2008)

Patient education according to US national Guidelines (Camargo, Rachelefsky & Schatz, 2009) we can give the patient these recommendations:

1. Patient education, including a written asthma action plan should be given as a self-management plan to guide patient at home in case of exacerbations.
2. A peak flow-based plan especially with patient having worsened asthma symptoms.
3. Patient has to learn to identify any signs of deterioration of asthma. For example, a reduction of PEF reading to less than of 80%, then the patient has to take a rapid action by increasing the inhaled dose of Beta 2 agonist. If PEF is 50-79 present, the patient must monitor her PEF and still having Beta 2 agonist (relief- medication) and she has to contact her clinician to arrange a visit. However, if PEF dropped to less than 50, patient should go to the emergency department for rapid medical care.
4. Elimination of the environmental factor contributing to the exacerbation, in this case patient has to avoid handling dust, remove carpets from home and she has to use special mattress cover and pillow cover on her bed to prevent more inhalations of dust mite particles.
5. Quick communication between patient and clinician about any serious worsening in symptoms or peak flow reading. In addition, if there is any

decrease in response to inhalers or decrease in its duration of effect.

(Camargo, Rachelefsky & Schatz, 2009)

#### 6. Discussion including explanation of details of literatures review

Peak Expiratory Flow has a value in measuring air flow limitations. The relationship between peak flow values and clinical symptoms is variable because of patient's perceptions to different changes in the airways patency. (Clausen, Coates & Quanjer, 1997) Peak flow meter is an essential tool in asthma control and management to decrease asthma exacerbation. A lot of patients not familiar with the importance and the use of the peak flow, for example ; in United Arab emirates (UAE) only 17. 8% owned a peak flow meter.(Hassan Mahboub, Santhakumar, Soriano, et al, 2010)

There are some differences between PFM and Spirometry. The peak flow meters have been used for monitoring patients with asthma. Peak flow meter quantities the level of the ability of the patient to exhale. Peak flow measurements show a strong correlation between Peak Expiratory flow (PEF) and Forced Expiratory Flow (FEV1)., and its diurnal variations as a one of diagnostic tool in asthma managment are well established. PEF monitoring might be an excellent aid in titrating treatment to prevent the asthma exacerbation.

In contrast, spirometry objectively measures the lung function. It measures the Expiratory Vital Capacity (EVC) which is the maximum volume of air which can be exhaled from the lungs after a full inspiration. In addition, it measures Inspiratory Vital Capacity (IVC), which is the maximum amount of air that can be inspired after full expiration. Moreover, the expiratory phase is measuring any obstruction or restriction in the lungs. The test can be done

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in regard to time as to measures vital capacity (VC) as a static test or a dynamic test to measure forcible effort against time as FEV1 in one second from a maximum inspiration. Peak Expiratory Flow Rate (PEFR): Is the highest forced expiration flow in 10 milliseconds It is measured in Litres per minute with a peak flow meter. Forced Expiratory Flow Rate (FEFR 25% - 75%); this represents the average forced expiratory flow rate in Litres per second at the middle part of the FVC. It shows what is happening in the lower airways and it is the early alarming sign of the disease.

The peak flow measures might have slight higher values than spirometry in healthy people. This advises that the predicted PEF measures should be made by peak flow meters. (Bener, Almeahdi, Alwash, et al, 2001)

Peak flow recording should be at least six readings at times, both in the morning and evening over a three-week period. We should calculate an average for the morning and evening data separately. In general, it was observed that the average evening record to be higher than the morning average.

It was observed that the patient might alter the measurements of PFM to deliver significant raising results. A study had done on 15 patients showed that by retarded the movement of the PF indicator by the index finger of the patient, a false raised measures could be achieved, which would affect the patient management plan. (Ross & Cochran, 2001)

Peak flow meter could be used for many years according the manufacturer's instructions. (Douma, van der Mark, Folgering, et al, 1997) It should be examined if there is any tears on it and should be calibrated to provide

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similar reading . For example, it should make accurate flow range (0-900 L min) ( 0-15 L . s). The calibration has to be done in flow meter labs. There are many physiological factors affect the peak flow such as the diminutions of intra- thoracic and extra-thoracic airways, the tone of expiratory muscles, the speed of alveolar pressure and the volume history of the lung. In addition, there are other physiological pathological causes like a disorder of the structure or the functions airways and other interstitial lung diseases. (Jain, Kavuru, Emerman, et al, 1998)

Peak flow meters reading might be affected by its physical features, weather, altitude and temperature, altitude, and humidity (Pedersen, Miller, Sigsgaard, et al, 1994))

In cases of asthma exacerbations, spirometry is preferable than peak flow meter. In addition, PEF measured by PF meter is less sensitive than spirometry in evaluating the post bronchodilator test or challenge testing(Jain, Kavuru, Emerman, et al, 1998)

In spite of, the importance of Peak Flow meter reading in monitoring of asthma control , however; the patient admission at the hospital in case of asthma exacerbation should depend on different parameters, not only PF reading . For example, the severity of the case , oxygen blood saturation, chest infection and other morbidity diseases such as , diabetes of hypertension .

Wheezing in asthma exacerbation must be differentiated between other chest wheezing sounds, especially on bronchitis or pneumonia, or viral wheezing and other vocal cord diseases that could give different chest

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sound. In spite of the drop in PEF reading, wheezing could be absent in exacerbations. This might be (Bascom, 1996) because the patient might have a dose of bronchodilator before coming to the hospital.

The causes of exacerbation could be indoor inhalant allergen exposure and pollution are playing a role in asthma exacerbation. Moreover Stress and depression have an imperative role in asthma exacerbation in adult (Centanni, Di Marco, Castagna, et al, 2000) (Bascom, 1996) (Bousquet, Khaltaev, Cruz, et al, 2008; Ghio, 2008) (Bonay & Aubier, 2007)

Asthma exacerbations increased by > 20% in the premenstrual phase in asthma patients in comparison to other menstrual phases, preovulatory phase. (Nakasato, Ohru, Sekizawa, et al, 1999; Pereira-Vega, Sánchez, Maldonado, et al, 2010)

It is well known that there is a relationship between gastro-oesophageal reflux disease and asthma (GERD). In addition, gastro-oesophageal reflux is responsible about undiagnosed dry cough and in somewhere exacerbates the asthma symptoms. In addition, the treatment of GIRD may improve the asthma conditions. The endoscopic severity of RE is associated with the characteristics of adult asthmatics and the treatment of severe RE improved the asthmatics' condition. (Nakase, Itani, Mimura, et al, 1999) (Gaude, 2009)

Exclusion of other types of asthma on hairdresser females patient, because is the presence atopic conditions as a risk factor such as; rhinitis and dermatitis might increase the prevalence of occupational asthma in such patients. (Espuga, Muñoz, Plana, et al, 2011)

## **5. Conclutions recommendations**

This case study shows the significance role of the inhalants allergens in in asthma exacerbation and of developing a management plan that is exclusive for each patient. Peak flow results and his chest and nasal symptoms indicate mild persistent asthma and perennial allergic rhinitis

She had did not visit her doctor since two months and continued using a short-acting  $\beta_2$ -agonist and budesonide regularly. The patient did not recognize that she might have been at risk for exacerbations symptoms and further deterioration of his pulmonary function. We know that even in mild asthma, fatal exacerbations are possible. Proper control treatment of chronic asthma may prevent exacerbations. In addition, right referral to allergist to identifying the cause of allergic asthma is an important tool for long term management plan.

Moreover, asthma education strategies such as verbally instructions and written action plan instructions on the importance of obedience to treatment and the correct inhaler usage. In addition, the adherence and correct use of peak flow meter would give more help for the patient to improve current symptoms and decrease the risk of exacerbation and consider as a key component of positive clinical outcomes.