ABSTRACT
COPD is a disease displaying progressive airflow limitation caused by inflammatory reaction in lungs resulting from inhalation of noxious particles or gas. With this disease airflow to the lungs is restricted. In this case breathing become hard for the patient and it may be fatal on severe exposure. It is the third leading cause of death in united states. The main cause of COPD is long-term exposure to substances that irritate and damage lungs, it is usually cigarette smoke, air pollution, chemical fumes or dust can also cause it. It is often preventable and treatable. So here we discussed in detail about the symptoms, diagnosis, treatment and preventive measures that are to be taken.

KEYWORDS : COPD, inflammation, lungs, Emphysema.

INTRODUCTION
COPD is general term which includes the conditions chronic bronchitis and emphysema.
- Chronic means persistent.
- Bronchitis means inflammation of bronchi( the airways of lungs ).
- Emphysema is damage to smaller airways and air sacs(alveoli) of the lungs.
- Pulmonary means 'affecting the lungs'.

Tobacco smoking is the most common cause, with a number of other factors such as air pollution and genetics playing a smaller role. In the developing world, one of the common sources of air pollution is from poorly vented cooking and heating fires. Long-term exposure to these irritants causes an inflammatory response in the lungs resulting in narrowing of the
small airways and breakdown of lung tissue known as **emphysema**. The diagnosis is based on poor airflow as measured by lung function tests. In contrast to asthma, the airflow reduction does not improve significantly with the administration of medication. COPD can be prevented by reducing exposure to the known causes. This includes efforts to decrease rates of smoking and to improve indoor and outdoor air quality. In COPD, it may take longer to breathe out than to breathe in. Chest tightness may occur but is not common and may be caused by another problem. Those with obstructed airflow may have wheezing or decreased sounds with air entry on examination of the chest with a stethoscope. A barrel chest is a characteristic sign of COPD, but is relatively uncommon. Tripod positioning may occur as the disease worsens.

**Risk Factors**

I. Risk factors include exogenous factors such as smoking and air pollution as well as endogenous factors of patients themselves. The greatest exogenous factor is smoking, since this condition occurs only in some smokers, it is considered that is easy to develop in patients who are more sensitive to cigarette smoke.

II. The most definite endogenous risk factor is the genetically inherited α1-antitrypsin deficiency. In addition there are several candidate genes related to cause of COPD, but sufficient evidence is lacking.

III. The main exogenous factor is smoking. In addition there are occupational dusts and chemical materials (vapors, irritant substances, smoke), passive smoking and respiratory infectious diseases.

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<th>Most important factors</th>
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<td>Exogenous factors</td>
<td>Smoking</td>
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<td>Exposure to occupational dusts and chemical materials</td>
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<tr>
<td>Endogenous factors</td>
<td>α1- AT deficiency</td>
<td>Airway hypersensitivity related to host genetic polymorphism.</td>
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**Etiology**

- The main hypothesis explaining the etiology of COPD involves imbalance of protease/anti protease and imbalance of oxidant/anti oxidant.
New hypotheses are appearing due to the results of recent animal experiments producing pulmonary emphysema. Apoptosis of lung cells may also be involved.

Airway inflammation and destruction of alveolar walls occurs as a result of what can be termed as pulmonary disorder attack factors such as various proteases or oxidative stress overwhelming the protective factors of antiprotease or anti oxidative materials either quantitatively or qualitatively.

**Symptoms**

- **Cough** is usually the first symptom to develop. It is productive with phlegm (sputum). It tends to come and go at first, and then gradually becomes more persistent (chronic). You may think of your cough as a 'smokers cough' in the early stages of the disease. It is when the breathlessness begins that people often become concerned.

- **Breathlessness (shortness of breath) and wheeze** may occur only when you exert yourself at first. For example, when you climb stairs. These symptoms tend to become gradually worse over the years if you continue to smoke. Difficulty with breathing may eventually become quite distressing.

- **Sputum** - the damaged airways make a lot more mucus than normal. This forms sputum. You tend to cough up a lot of sputum each day.

- **Chest infections** are more common if you have COPD. A sudden worsening of symptoms (such as when you have an infection) is called an exacerbation. Wheezing with cough and breathlessness may become worse than usual if you have a chest infection and you may cough more sputum. Sputum usually turns yellow or green during a chest infection. Chest infections can be caused by germs called bacteria or viruses. Bacteria (which can be killed using antibiotic medicines) cause about 1 in 2 or 3 exacerbations of COPD. Viruses (which cannot be killed with antibiotics) are a common cause of exacerbations too, particularly in the winter months. The common cold virus may be responsible for up to 1 in 3 exacerbations.

- Other symptoms of COPD can be more vague. Examples are weight loss, tiredness and ankle swelling.

- Chest pain and coughing up blood (haemoptysis) are not common features of COPD.

- On visual inspection pursed lip breathing, barrel chest (increase in anteroposterior dimension of the chest), paradoxical movement of chest (Hoovers sign) are recognised.

- Reduction in the movement of chest due to hyperinflation of lung and decrease in respiratory sounds and extended expiration, forced expiration sometimes are seen.
What’s the difference between chronic obstructive pulmonary disease and asthma?

COPD and asthma cause similar symptoms. However, they are different diseases.

Briefly

- In COPD there is permanent damage to the airways. The narrowed airways are fixed, and so symptoms are persistent (chronic). Treatment to open up the airways is therefore limited.
- In asthma there is inflammation in the airways which makes the muscles in the airways constrict. This causes the airways to narrow. The symptoms tend to come and go, and vary in severity from time to time. Treatment to reduce inflammation and to open up the airways usually works well.
- COPD is more likely than asthma to cause an ongoing cough with phlegm (sputum).
- Waking at night with breathlessness or wheeze is common in asthma and uncommon in COPD.
- COPD is rare before the age of 35 whilst asthma is common in under-35s.
- There is more likely to be a history of asthma, allergies, eczema and hay fever (so-called atopy) in people with COPD.

Diagnosis

Diagnostic criteria

- In presence of clinical symptoms such as cough, sputum or middle aged or old aged people who have risk factors such as a history of smoking, COPD must always be suspected.
- Spirometry is essential for diagnosis of this condition. Airflow limitation is judged to be present when the FEV$_1$ (Forced expiratory volume in one second) /FVC (Forced vital capacity) ratio is less than 70% after the administration of bronchodilators.
- For a definitive diagnosis, it is necessary to exclude various other diseases by means of diagnostic imaging and detailed pulmonary function tests.
- COPD must be always thought of as a possibility, and spirometry performed, in the presence of any of the following symptoms,
  - Chronic cough
  - Chronic sputum production
  - Dyspnea on exertion
  - Long term exposure to tobacco or occupational dusts
• **Reversibility test for airflow limitation**: This examination should be performed with the patient in a stable clinical state. Patient must not take short acting barbiturates in the previous 6 hours or long acting barbiturates in the previous 24 hours. The bronchodilator used for the test is usually a short acting inhaled beta₂ stimulator which is administered metered dose inhaler(MDI) with spacer or nebulizer. The examination should be performed 30 to 60 minutes after inhalation. The airflow limitation is considered reversible when FEV₁ is at least 12% and 200mL or more greater than the pre-bronchodilator FEV₁.

**Stage classification**

The stages in the advancement of COPD are classified using the FEV₁ value which express the degree of airflow limitation. The classification reflects the severity of the disease. The FEV₁/FVC ratio is not used because it does not appropriately reflect the degree of severity in case of moderate or more severe COPD. The stage classification uses the post-bronchodilator FEV₁. The stages are,

<table>
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<th>Stage</th>
<th>Characteristic features</th>
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<td>Stage 0 : Group at risk for COPD</td>
<td>Results of Spirometry are normal, presence of chronic symptoms (cough and sputum)</td>
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| Stage I : Mild COPD | FEV₁/FVC<70%  
FEV₁≥80% predicted regardless of presence or absence of chronic symptoms. |
| Stage II : Moderate COPD | FEV₁/FVC<70%  
50%≤FEV₁<80% predicted regardless of presence or absence of chronic symptoms. |
| Stage III : Severe COPD | FEV₁/FVC<70%  
30%≤FEV₁<50% predicted regardless of presence or absence of chronic symptoms. |
| Stage IV : Very severe COPD | FEV₁/FVC<70%  
FEV₁<30% predicted or FEV₁<50% predicted accompanied with chronic respiratory failure or right heart failure. |

**Clinical findings**

The clinical findings are based on the breathlessness of the patient, they are measured on a certain scale. The scale is based on the following grades,

- Grade 0 : No breathlessness.
- Grade 1 : Breathlessness with strenuous exercise.
- Grade 2 : Short of breath when hurrying on the level or walking up a slight hill.
Grade 3: Walk slower than people of the same age on the level or stop for breath while walking at own pace on the level.
Grade 4: Stop for breath after walking about 100 yards or after a few minutes on the level.
Grade 5: Too breathless to leave the house or breathless when dressing or undressing.

**Diagnostic imaging**
A chest x-ray film is used to exclude other diseases or to diagnose relatively advanced pulmonary emphysema or airway lesions. It is difficult to detect early stages of COPD on plain chest x-ray film. High resolution CT (HRCT) can be effective in the early detection of emphysema predominant type COPD. On HRCT, pulmonary emphysema lesions appear as low attenuation areas (LAA). Each LAA can be distinguished from the normal lung and they are characterized by not having a capsule. Findings suggestive of airway lesions can be detected by HRCT, thus it can be effective in determining the phenotype of COPD.

**Visual evaluation of Pulmonary Emphysema**: Right and left lungs are divided into six areas consists of the upper, middle and lower lung fields on both sides. The degree of severity of pulmonary emphysema is evaluated using a five point scale for each lesion.
- **0 point**: No emphysematous lesions.
- **1 point**: Occupying less than 25% the entire lung.
- **2 points**: Occupying from 25 to less than 50% of the entire lung field.
- **3 points**: Occupying from 50 to less than 75% of the entire lung field.
- **4 points**: Occupying more than 75% of the entire lung field.

**Pulmonary function test**
In COPD it is essential to establish a diagnosis of the presence of airflow limitation. It is done by Spirometry. In this test patient is asked to breath into a machine called spirometer. The spirometer takes two measurements, The volume of air you can breathe out in one second (called the FEV₁) and total amount of air you can breathe out (called FCV). A post bronchodilator FEV₁/FCV less than 70% is considered to indicate the presence of airflow limitation. Decrease in the gas exchange function of COPD patient can be grasped by examining the decrease in diffusing capacity.
Exercise tests, respiratory muscle function tests, sleep studies

Exercise test is useful for evaluating the degree of severity, clarifying the exercise limiting factors of the respiratory and circulatory systems, deciding on the therapeutic strategy and its effectiveness, and also for prognostic evaluating.

In COPD, the ventilation system is the major limiting factor of exercise. In several cases, Hypoxemia during exercise, pulmonary circulation disturbance and decreased oxygen transport capability may also limit the exercise capacity. Both inspiratory and expiratory muscle strength is reduced in COPD, but the degree of decrease is greater in inspiratory muscle strength.

There is a tendency toward marked decrease in the arterial blood oxygen saturation during sleep in patients who show a decrease in partial oxygen pressure (PaO2) when awake. In these patients, a tendency towards hypoxemia is particularly marked during REM sleep.

Arterial blood gas measurement

PaO2 value of 60 Torr or less breathing room air at rest is diagnosed as respiratory failure and the PaCO2 value of 45 Torr or more is said to indicate the accumulation of Carbon dioxide. Measurement of SpO2 using a pulse oximeter allows continuous non-invasive measurement, but it is necessary to understand all points requiring caution for the measurement.

Evaluation of pulmonary Hypertension and Cor pulmonale

In diseases like COPD which effects the ventilation primarily, the pulmonary hypertension is considered to be indicated by an mean pulmonary arterial pressure of 20 Torr. Cases of COPD usually do not have severe hypertension and the pattern of progression is gradual, but it can increase transiently on episodes of exacerbation, under exercise loading or during sleep in sleep related respiratory diseases.

Quality of life (QOL) assessment

The purpose of COPD treatment is to improve quality of life by alleviating respiratory symptoms, reducing the chronological decrease in pulmonary function and avoiding exacerbation. QOL should be quantitatively assessed using standardized questionnaires which evaluate the effect of disease on the activities of daily living and degree of well being.
Treatment

1. **Smoking cessation**: Smoking is the main risk factor of disease, causing air flow limitation and accelerating the reduction in pulmonary functions. There are reports that the progression of decrease in pulmonary function can be delayed through smoking cessation. It is considered to be a drug addiction i.e. nicotine addiction. To decide on addiction the Fagerstrom nicotine dependence test is often used. Cessation is the most important and effective, cost effective, method of intervention to reduce the risk of occurrence of COPD and to hold back its progress. It is reported that even with a short three minute period of smoking cessation advice from the clinician causes an increase in the rate of quitting smoking. It is promoted by combining an active scientific approach for behavioral therapy and a pharmacological approach. Nicotine replacement therapy is also performed simultaneously with cessation. It is done by chewing the nicotine gum and get used to it.

2. **Management of stable COPD**
   - **Mild**: In addition to smoking cessation, the use of short acting bronchodilators is recommended when needed in order to alleviate symptoms.
   - **Moderate**: In order to improve exercise capacity along with decreasing symptoms, regular treatment with long acting bronchodilators and pulmonary rehabilitation is recommended.
   - **Moderate to very severe**: Regular use of more than one bronchodilator concerning the evaluation of effectiveness of Mucolytic agents.
   - **Severe to very severe**: Prevention of exacerbation is very important, it can be achieved by the use of inhaled glucocorticosteroids.

A. **Pharmacological treatment**: There are no effective drugs for curing but they can reduce the symptoms effectively, prevents exacerbation and increase quality of life. Bronchodilator medications which are central to the pharmacological treatment should be given on a step by step basis in response to the degree of severity of disease. The action of individual patient should be studied and most appropriate drug is selected for treatment. Various bronchodilators such as anticholinergics $\beta_2$ agonists and methylxanthines with different mechanisms. Considering the balance between effect and adverse effect rather than increasing dose of single agent use multiple agents. Continuous administration of inhaled glucocorticosteroids does not suppress the deterioration of respiratory function, but some cases in which the $\%$ FEV$_1$ is less than 50% with frequent episodes of exacerbation. It has been
reported that such treatment can reduce the number of episodes of exacerbation. Combined use of glucocorticoids and long acting B₂-agonists improve the FEV₁ and reduces the exacerbation and improves quality of life. The use of influenza vaccines has been reported to reduce by 50% the mortality of COPD cases due to exacerbation of the condition, thus all COPD cases should be given vaccines.

(a) Anticholinergics: Reversible airway constriction in COPD patients depends mainly on acetylcholine deriving from vagus nerve. Consequently, the most effective single agent to dilate airways would appear to be anti-cholinergic agent. There is no evidence of decrease in effectiveness after long-term administration. Long acting agents have effects for 24 hours after inhalation with significant improvement in FEV₁ and FVC remaining until the morning after administration. These agents can cause urinary retention in patients with prostate hypertrophy and can exacerbate glaucoma.

(b) β₂ agonists: The most rapid initiation of bronchodilating effects is through the use of short-acting β₂ agonist inhalation. A single administration of long acting agent yields effects for 12 hours with no decrease in effectiveness. Good compliance can be anticipated with the use of patch type of agonists also.

(c) Methylxanthines: While these drugs are not as effective in improving the FEV₁ value compared to inhaled bronchodilators. As per theory when these are given orally, they should have a better effect on dilation of peripheral airways and reduce overexpansion of the lung and ameliorate dyspnea on exertion. It has been suggested that low dose theophylline reduces the amount of inflammatory cells in the airway.

(d) Inhaled glucocorticosteroids: Inhalation of these agents can help reduce the number of episodes of exacerbation of COPD in patients with %FEV₁ of less than 50% of the predicted value and can reduce the rate of deterioration of QOL. There are few reports on dose-response relationship of inhaled steroids in COPD patients. In large scale trails, high-dose inhaled steroids have been used.

B) Comprehensive pulmonary rehabilitation: It can contribute to the improvement of effectiveness of patients, even those who are already on pharmacologic therapy. It is a team medical effort an even greater positive effect can be anticipated by having multiprofessional team working on this program. Exercise therapy is the central component of this program.
When starting exercise training, it is desirable to condition patients by adjusting their breathing patterns and providing them with flexibility training to ensure efficient exercise training. It should be performed continuously and regularly, as in the correct practice of regular inhalation pharmacologic therapy. Following the induction phase of the program, the maintenance phase consists of central components including endurance and muscle strength training. By this time it is desirable for the patients to have formed an exercise habit incorporated into their lifestyle.

C) Patient education: It occupies an extremely important position in all processes of prevention, diagnosis and management of COPD. Specialists from multiple fields should participate in the patient education. The most effective educational method is to conduct patient education systemically in a programmed comprehensive pulmonary rehabilitation.

D) Nutrition management: Approximately 25% of patients with moderate or more severe disease and 40-50% of very severe disease, the ideal body weight (IBW) has decreased to less than 90% or there has been decrease in lean-body mass (LBM). The development of respiratory failure and cumulative mortality are high in patients in which loss in body weight is seen. It is the prognostic factor independent of air flow limitation. In case of IBW less than 90% there is usually disturbance in nutrition. Dietary treatment is indicated in such cases.

E) Oxygen therapy: In case of COPD with hypoxemia, long term oxygen therapy (LTOT), 15 hours or more per day, can improve the survival rate. This therapy is indicated in cases of severe chronic respiratory failure in patients with a PaO$_2$ of 55 Torr or less, or in cases with PaO$_2$ of 60 Torr or less in whom there is remarkable hypoxia during sleep or exercise. The decision on the indication for the procedure can be made based on the measurement of PaO$_2$ by pulse oxymeter oxygen saturation measurement. During indication it is important to educate not only the patient but also the family regarding the therapy. In cases of hypoxemia at rest or with a lower limit of normal PaO$_2$, travel by airplane can result in exacerbation of hypoxemia.

F) Ventilation support: It is important to have a team for the introduction and continuation of ventilation therapy. At present there is no persuasive evidence as to the effectiveness of noninvasive intermittent positive pressure ventilation (NIPPV) treatment for chronic stable COPD patients. In future randomized clinical trials are necessary to determine this point. For home tracheostomy intermittent positive pressure ventilation (TIPPV), there is a great
necessity for a diagnostic and therapeutic system as well as nursing or home help support system.

G) Lung volume reduction surgery: Indications for this surgery are as follows
- A definitive diagnosis of emphysema has been obtained based on clinical findings or spirometry.
- Despite fully sufficient medical treatment, dyspnea has continued.
- Chest CT and ventilatory blood flow on scintigraphy show inhomogeneous lesion distribution (emphysematous change).

The national emphysema treatment trial (NETT) study shows that surgical treatment contributed to survival in cases in which the emphysematous changes were more predominant in the upper lobes of the lung and in which there was a low exercise capability. There is data indicating that three years post operatively, the physiological functions are better than before operation.

H) Management during exacerbations: The appearance of exacerbation increases the hospitalization of COPD patient, increases the mortality ratio and has a very seriously negative effect on prognosis. The most common causes of exacerbation are respiratory tract infection and air pollution. However causes are unknown in about one-third of cases. To control this it is essential to either increase the dose or the frequency of administration of bronchodilators. Short acting β₂ agonists are frequently employed. Systemic administration of glucocorticosteroids (Oral/I.V) can shorten the time to recovery and can also hasten recovery of lung function. Cases with increase of sputum or increase of purulence are probably related to bacterial airway infections, therefore antibacterial agents are recommended. In the outpatient clinic oral penicillin and new quinolone drugs are recommended and in hospitalized cases injection of β -lactam drugs/ β-lactamase inhibitors, third generation caphem drugs, carbapenem drugs and new quinolones are recommended. Administration of anti-bacterial agents, steroids or bronchodilators is effective in reducing airway secretions and to improve airway clearance in the period of exacerbation. Sputum is eliminated widely in cases of acute exacerbation as well as chronic stable condition.

Latest Discoveries On Copd
1) Heat waves could worsen the copd symptoms - As air temperatures rise, so too may the symptoms, a new study suggests. Patients exposed to warmer temperatures indoor had a
worsening of their symptoms and a decrease in lung function., warmer temperatures outside also linked to an increase in symptoms.

2) Certain sedatives tied to breathing problems in older patients - A group of widely used sedatives like Benzodiazepines such as lorazepam or alprazolam increases the risk of serious breathing problems in older patients. It also had a greater risk of needing to go to emergency room for treatment.

3) Exercise may curtail copd complications - Exercise might help reduce the risk of hospital readmission in patients. Studies suggest that regular physical activity could buffer the stresses of hospitalization.

4) Copd may damage aging brain - Seniors with copd have an increasing risk of developing mental decline, especially thinking problems without apparent memory loss, a new study suggests. This diminished brain function is called 'nonamnestic' mild cognitive impairment. It is associated with problems with attention, planning and problem solving, but not with memory.

5) 2-mile daily walk might help fight copd - Taking daily walks of at least two miles can reduce the risk of hospitalization from severe episodes of this life threatening disease. Scientists found that copd patients without regular walking regimens had about twice the rate of hospitalization triggered by the condition compared to those who maintained the highest levels of physical activity.

6) Smoke free laws may prevent the severity - People with copd are less likely to be hospitalized for breathing problems if they live in area where local laws prohibit smoking in public spaces including bars, restaurants and offices. Irritants such a pollen, air pollutants and cigarette smoke can worsen the condition. Thus living in smoke free areas may lessen the risk.

CONCLUSION
COPD is ranked as the fourth leading cause of death killing over millions of people. The number of deaths is projected to increase due to higher smoking rates and an aging population in many countries. As discussed above many treatment options are available up to certain extent but quitting smoking is the only way to prevent the disease.
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