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A REVIEW ON CHRONIC OBSTRUCTIVE PULMONARY DISEASE

B. Bhanu Prasad Reddy*, Dr. D. Hepcy Kalarani, Dr. P. Venkatesh, Dr. R. Prema

Jagan's Institute of Pharmaceutical Sciences, Jangala Kandriga (V), Muthukur (M), SPSR Nellore (Dist).

***Corresponding Author: B. Bhanu Prasad Reddy**
Jagan's Institute of Pharmaceutical Sciences, Jangala Kandriga (V), Muthukur (M), SPSR Nellore (Dist).

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ABSTRACT
Chronic obstructive pulmonary disease (COPD) results in high morbidity and mortality among patients both domestically and globally. Chronic bronchitis and emphysema are older terms used for different types of COPD. Chronic obstructive pulmonary disease is a highly prevalent disease characterized by non reversible airway obstruction. Well characterized symptoms such as exertional dyspnea and fatigue have a negative impact on patient's quality of life and restrict physical activity in daily life. The impact of COPD symptoms on quality of life is often underestimated; for example, 36% of patients who describe their symptoms as being mild to moderate also admit to being to breathless to leave the house. Additionally, early morning and nighttime symptoms are a particular problem. Methods are available to allow clinicians to accurately assess COPD symptoms, including patient questionnaires. Integrated approaches to COPD management, particularly pulmonary rehabilitation, are effective strategies for addressing symptoms, improving exercise capacity and potentially also increasing physical activity. Inhaled bronchodilators continue to be the mainstay of drug therapy in COPD, where options can be tailored to meet patient's needs with careful selection of the inhaled mediation and the device used for its delivery. Overall, an integrated approach to disease management should be considered for improving quality of life and subsequent patient outcomes in COPD.

KEYWORDS: Chronic obstructive pulmonary disease, patients, physical activity levels, pulmonary rehabilitation.

INTRODUCTION

Chronic obstructive pulmonary disease significantly contributes to health care costs with high rates of morbidity and mortality. A diagnosis of COPD is determined by clinical assessment of airflow limitation and symptoms such as cough and wheeze; however, the detrimental effect of COPD symptoms on patient's quality of life is often underestimated.

In order to better understand and address the impact of COPD symptoms from a patient's perspective, integrated approaches to disease assessment and management are required. A recent observational study found that, regardless of disease severity, more than half of patients experienced COPD symptoms throughout whole 24 hour day, and nearly 80% of patients reported experiencing symptoms during at least two parts of the day. The presence of symptoms is associated with worse health status, depression, anxiety and poor sleep quality. The management of patients with COPD and comorbidities remains particularly challenging, the presence of other chronic conditions increases symptoms burden, reduces functional performance, has negative effects on health status, and management approaches need to be adopted accordingly.

The restriction of physical activity due to symptoms such as exertional dyspnea and fatigue also has a major adverse effect on a patient's quality of life, while preserving or improving physical activity may have far-reaching benefits for hospitalization and mortality rates. The aims of this article are to evaluate tools available for assessment for COPD symptoms and the impact of symptoms on the daily lives of patients.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

COPD is a lung problem with blockage in the air tubes which carry air in and out of lungs. Our air tubes become narrower. So the amount of air that can grow in is much less. Also, air cannot get out of lungs properly. Because of this lungs feel very full, chest fills tight and feel short of breath. All this makes breathing difficult, and if not taken care of, can get worse with time.

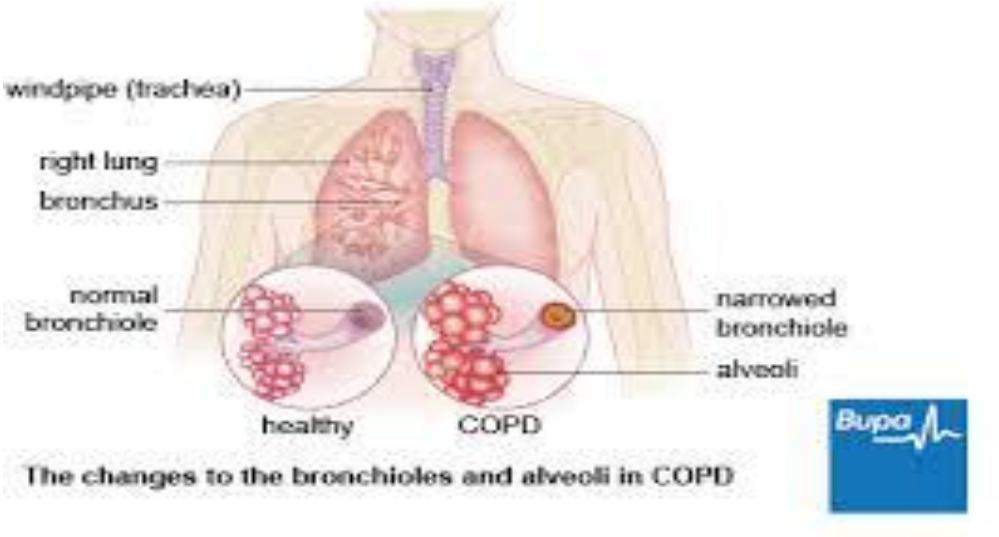

Figure 1: difference between normal lung and COPD affected lung.

PATHOPHYSIOLOGY

COPD is a type of obstructive lung disease in which chronic, incompletely reversible poor airflow (airflow limitation) and inability to breathe out fully (air trapping) exist. The poor airflow is the result of breakdown of lung tissue (known as emphysema), and small airways disease known as *obstructive bronchiolitis*. The relative contributions of these two factors vary between people. Severe destruction of small airways can lead to the formation of large focal lung pneumatoses, known as bullae that replace lung tissue. This form of disease is called bullous emphysema.

COPD develops as a significant and chronic inflammatory response to inhaled irritants. Chronic bacterial infections may also add to this inflammatory state. The inflammatory cells involved include neutrophil granulocytes and macrophages, two types of white blood cells. Those who smoke additionally have Tc1 lymphocyte involvement and some people with COPD have eosinophil involvement similar to that in asthma. Part of this cell response is brought on by inflammatory mediators such as chemotactic factors. Other processes involved with lung damage include oxidative stress produced by high concentrations of free radicals in tobacco smoke and released by inflammatory cells, and breakdown of the connective tissue of the lungs by proteases that are insufficiently inhibited by protease inhibitors. The destruction of the connective tissue of the lungs leads to emphysema, which then contributes to the poor airflow, and finally, poor absorption and release of respiratory gases. General muscle wasting that often occurs in COPD may be partly due to inflammatory mediators released by the lungs.

Narrowing of the airways occurs due to inflammation and scarring within them. This contributes to the inability to breathe out fully. The greatest reduction in air flow occurs when breathing out, as the pressure in the chest is compressing the airways at this time. This can result in more air from the previous breath remaining within the lungs when the next breath is started, resulting in an increase in the total volume of air in the lungs at any given time, a process called hyperinflation or air trapping. Hyperinflation from exercise is linked to shortness of breath in COPD, as breathing in is less comfortable when the lungs are already partly filled. Hyperinflation may also worsen during an exacerbation into the blood.

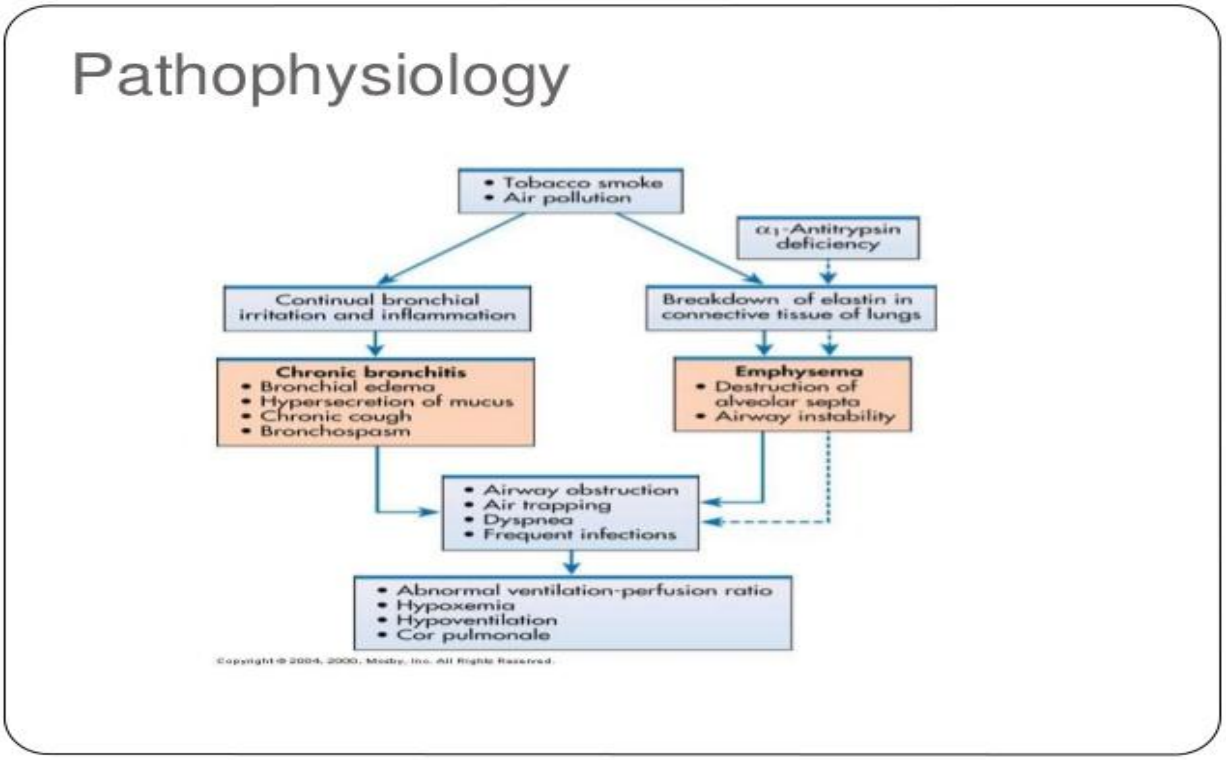

Figure 2: pathophysiology of COPD.

CAUSES OF COPD

Cigarette smoke: This is by far the most common reason people get COPD. It may also get it from tobacco products, such as cigar and pipe smoke, especially if you breathe in the smoke

Secondhand smoke: even if you aren't a smoker, you can get COPD from living with one.

Pollution and fumes: you can get COPD from air pollution. Breathing in chemical fumes, dust, or toxic substances at work can also cause it.

Genes: in rare cases, people with COPD have a defect in their DNA, the code that tells our body how to work properly. This defect is called alpha-1 anti trypsin deficiency.

Asthma: if don't treat asthma, lung damage over time can lead to COPD.

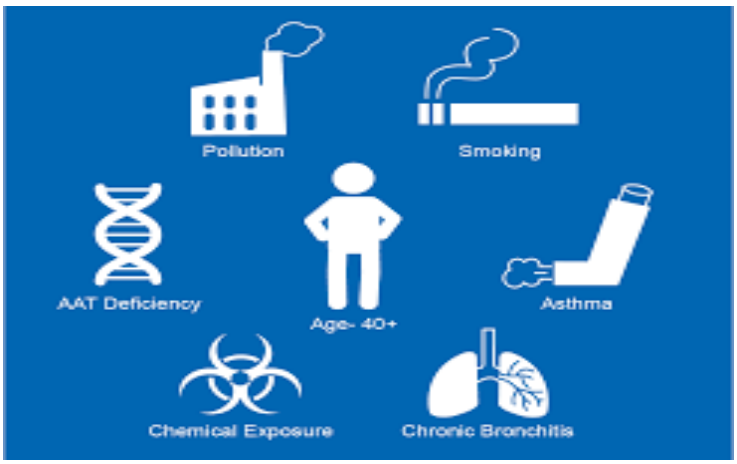

Figure 3: causes of COPD.

SYMPTOMS OF COPD

Symptoms often don't appear until significant lung damage has occurred, and they usually worsen over time, particularly if smoking exposure continues. For chronic bronchitis, the main symptom is a daily cough and mucus (sputum) production at least three months a year for two consecutive years.

Other signs and symptoms of COPD may include:

- Shortness of breath, especially during physical activities
- Wheezing

- Chest tightness
- Having to clear your throat first thing in the morning, due to excess mucus in your lungs
- A chronic cough that may produce mucus (sputum) that may be clear, white, yellow or greenish
- Blueness of the lips or fingernail beds (cyanosis)
- Frequent respiratory infections
- Lack of energy
- Unintended weight loss (in later stages)
- Swelling in ankles, feet or legs.

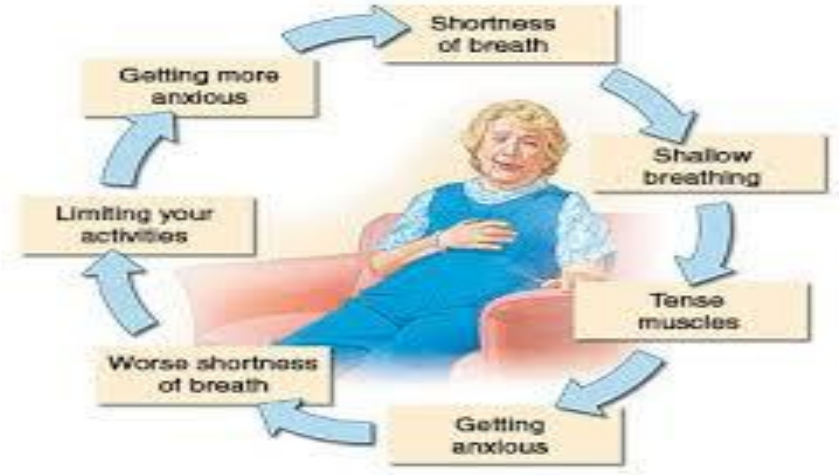

Figure 4: symptoms of COPD.

RISK FACTORS FOR COPD

The main risk factor for COPD is smoking. It causes up to 90 percent of COPD deaths, according to the American Lung Association (ALA). People who smoke are more likely to die from COPD than those who never smoked.

Long-term exposure to tobacco smoke is dangerous. The longer you smoke and the more packs you smoke, the greater your risk is of developing the disease. Pipe smokers and cigar smokers are also at risk.

Exposure to secondhand smoke also increases your risk. Secondhand smoke includes both the smoke from burning tobacco and smoke exhaled by the person smoking.

STAGES OF COPD

- **Mild COPD or Stage 1**—Mild COPD with a FEV1 about 80 percent or more of normal.
- **Moderate COPD or Stage 2**—Moderate COPD with a FEV1 between 50 and 80 percent of normal.
- **Severe COPD or Stage 3**—Severe emphysema with a FEV1 between 30 and 50 percent of normal.
- **Very Severe COPD or Stage 4**—Very severe or End-Stage COPD with a lower FEV1 than Stage 3, or people with low blood oxygen levels and a Stage 3 FEV1.

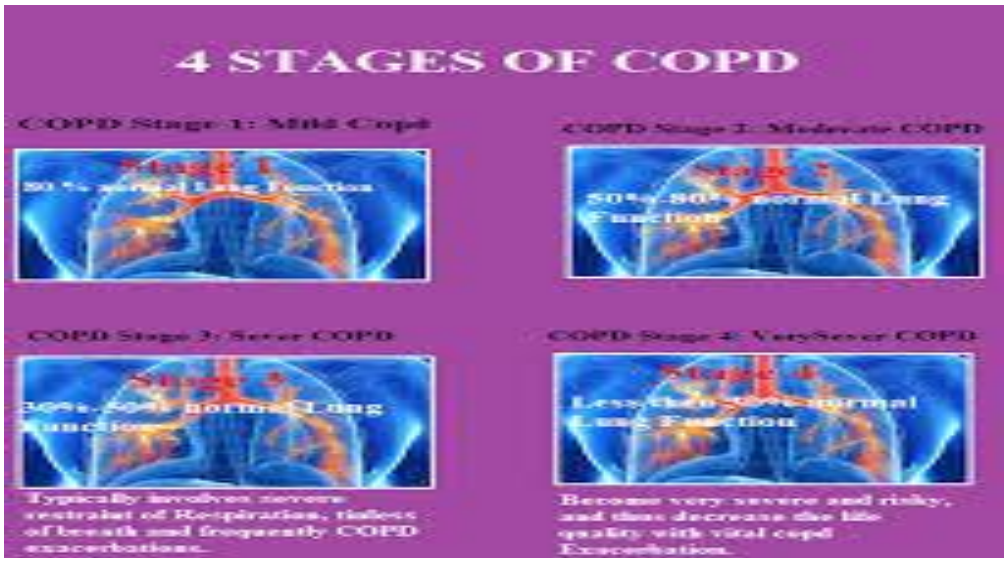

Figure 5: stages of COPD.

DIAGNOSIS OF COPD

Lung (pulmonary) function tests. Pulmonary function tests measure the amount of air you can inhale and exhale, and if your lungs are delivering enough oxygen to your blood.

Spirometry is the most common lung function test. During this test, you'll be asked to blow into a large tube connected to a small machine called a spirometer. This machine measures how much air your lungs can hold and how fast you can blow the air out of your lungs.

Spirometry can detect COPD even before you have symptoms of the disease. It can also be used to track the progression of disease and to monitor how well treatment is working. Spirometry often includes measurement of the effect of bronchodilator administration. Other lung function tests include measurement of lung volumes, diffusing capacity and pulse oximetry.

Chest X-ray. A chest X-ray can show emphysema, one of the main causes of COPD. An X-ray can also rule out other lung problems or heart failure.

CT scan. A CT scan of your lungs can help detect emphysema and help determine if you might benefit from surgery for COPD. CT scans can also be used to screen for lung cancer.

Arterial blood gas analysis. This blood test measures how well your lungs are bringing oxygen into your blood and removing carbon dioxide.

Laboratory tests. Laboratory tests aren't used to diagnose COPD, but they may be used to determine the cause of your symptoms or rule out other conditions. For example, laboratory tests may be used to determine if you have the genetic disorder alpha-1-antitrypsin (AAt) deficiency, which may be the cause of some cases of COPD. This test may be done if you have a family history of COPD and develop COPD at a young age, such as under age 45.

TREATMENT FOR COPD

Treatment can ease symptoms, prevent complications, and generally slow disease progression. Your healthcare team may include a lung specialist (pulmonologist) and physical and respiratory therapists.

Medication

Bronchodilators are medications that help relax the muscles of the airways, widening the airways so you can breathe easier. They're usually taken through an inhaler or a nebulizer. Glucocorticosteroids can be added to reduce inflammation in the airways.

To lower risk of other respiratory infections, ask your doctor if you should get a yearly flu shot, pneumococcal vaccine, and a tetanus booster that includes protection from pertussis (whooping cough).

Oxygen therapy

If your blood oxygen level is too low, you can receive supplemental oxygen through a mask or nasal cannula to help you breathe better. A portable unit can make it easier to get around.

Surgery

Surgery is reserved for severe COPD or when other treatments have failed, which is more likely when you have a form of severe emphysema.

One type of surgery is called bullectomy. During this procedure, surgeons remove large, abnormal air spaces (bullae) from the lungs.

Another is lung volume reduction surgery, which removes damaged upper lung tissue.

Lung transplantation is an option in some cases.

Lifestyle changes

Certain lifestyle changes may also help alleviate your symptoms or provide relief.

- If you smoke, quit. Your doctor can recommend appropriate products or support services.
- Whenever possible, avoid secondhand smoke and chemical fumes.
- Get the nutrition your body needs. Work with your doctor or dietician to create a healthy eating plan.
- Talk to your doctor about how much exercise is safe for you.

DRUDS USED IN COPD

SHORT ACTING BRONCHODILATORS

Bronchodilators help open your airways to make breathing easier. Your doctor may prescribe short-acting bronchodilators for an emergency situation or for quick relief use as needed. You take them using an inhaler or nebulizer.

Examples of short-acting bronchodilators include:

- albuterol (Proair HFA, Ventolin HFA)
- levalbuterol (Xopenex)
- ipratropium (Atrovent HFA)
- albuterol/ipratropium (Combivent Respimat)

Short-acting bronchodilators can cause side effects such as dry mouth, headache, or cough. These effects should go away over time. Other side effects include tremors (shaking), nervousness, and a fast heartbeat.

CORTICOSTEROIDS

Several types of corticosteroids are available. Some are inhalable and should be used every day as directed. They're usually prescribed in combination with a long-acting COPD drug.

Other corticosteroids are injected or taken by mouth. These forms are used on a short-term basis when your COPD suddenly gets worse.

The corticosteroids doctors most often prescribe for COPD are:

- Fluticasone (Flovent), which comes as an inhaler that you use twice daily. Side effects can include headache, sore throat, voice changes, nausea, cold-like symptoms, and thrush.
- Budesonide (Pulmicort), which comes as a handheld inhaler or for use in a nebulizer. Side effects can include colds or thrush.
- Prednisolone, which comes as a pill, liquid, or shot. It's usually given for emergency rescue treatment. Side effects can include headache, muscle weakness, upset stomach, and weight gain.

LONG ACTING BRONCHODILATORS

Long acting bronchodilators are medications that are used to treat COPD over a longer period of time. They're usually taken once or twice daily using inhalers or nebulizers.

Because these drugs work gradually to help ease breathing, they don't work as quickly as rescue medication. They're not meant to be used in an emergency situation.

The long-acting bronchodilators available today are:

- aclidinium (Tudorza)
- arformoterol (Brovana)
- formoterol (Foradil, Perforomist)
- glycopyrrolate (Seebri Neohaler)
- indacaterol (Arcapta)
- olodaterol (Striverdi Respimat)
- salmeterol (Serevent)
- tiotropium (Spiriva)
- umeclidinium (Incruse Ellipta)

Side effects of long-acting bronchodilators can include:

- dry mouth
- dizziness
- tremors
- runny nose
- irritated or scratchy throat
- upset stomach

More serious side effects include blurry vision, rapid or irregular heart rate, and an allergic reaction with rash or swelling.

COMBINATION DRUGS

Several COPD drugs come as combination medications. These are mainly combinations of either two long-acting bronchodilators or an inhaled corticosteroid and a long-acting bronchodilator.

Combinations of two long-acting bronchodilators include:

- glycopyrrolate/formoterol (Bevespi Aerosphere)
- glycopyrrolate/indacaterol (Utibron Neohaler)
- tiotropium/olodaterol (Stiolto Respimat)
- umeclidinium/vilanterol (Anoro Ellipta)

Combinations of an inhaled corticosteroid and a long-acting bronchodilator include:

- budesonide/formoterol (Symbicort)
- Fluticasone/salmeterol (Advair)
- Fluticasone/vilanterol (Breo Ellipta)

TABLE 1: MEDICATIONS USED IN THE PREHOSPITAL TREATMENT OF COPD EXACERBATION

Medication	Dose	Route
Short-Acting Beta Agonists		
Albuterol	5 mg	Inhaled/nebulizer
Fenoterol	1 mg	Inhaled/nebulizer
Levalbuterol	0.21/0.42 mg	Inhaled/nebulizer
Short-Acting Anticholinergics		
Ipratropium	0.25–0.5 mg	Inhaled/nebulizer
Oxitropium	1.5 mg	Inhaled/nebulizer
Glucocorticoids		
Prednisone	5–60 mg	Oral
Methylprednisolone	4, 8, 16 mg	Oral

ROFLUMILAST

Roflumilast (Daliresp) is a type of drug called a phosphodiesterase-4 inhibitor. It comes as a pill you take once per day.

Roflumilast helps relieve inflammation, which can improve air flow to your lungs. Your doctor will likely prescribe this drug along with a long-acting bronchodilator.

Side effects of Roflumilast can include:

- weight loss
- diarrhea
- headache
- nausea
- cramps
- tremors
- insomnia

DIET RECOMMENDATIONS

In general, people who have COPD should consider the following to maintain an optimal weight:

Monitor calories: The American Lung Association recommends that people with COPD keep close tabs on their weight. If you are overweight, you can lose weight by eating fewer calories. But don't eat so few calories that you feel fatigued and hungry all of the time. If you need to focus on maintaining or increasing your body weight, talk with your medical team or nutritionist about the foods you should be eating to keep the weight on.

Avoid fad diets: "Fad diets are not appropriate for COPD patients," says Make. People with COPD appear to fare best with a varied diet that provides a good balance of whole grains, fruits, vegetables, and lean proteins, according to research published in August 2014 in the *International Journal of Chronic Obstructive Pulmonary Disease*. This helps ensure that you're getting vitamins such as C, E, and D, which are among those tied to better outocomes with COPD.

Focus on protein: Work with your medical team or nutritionist to determine the amount of protein you need. "A lot of people do not get enough protein in their diet," says Make. He adds that protein is particularly important for COPD patients who are exercising as part of their pulmonary rehabilitation plan. The ALA recommends milk, eggs, cheese, meat, fish, poultry, nuts, and beans as good protein sources.

Watch your portions: "We tell our COPD patients to eat small meals frequently, rather than large meals," says Make. Eating several small meals throughout the day instead of two or three large meals can help lessen shortness of breath.

Get balanced: Focus on consuming fruits, vegetables, dairy products, whole grains, and lean proteins.

Limit salt: Consuming excessive sodium can lead to fluid retention, which can worsen your shortness of breath.

Remember your oxygen: If your medical team recommends it, use supplemental oxygen during and after meals to reduce shortness of breath when eating.

NATURAL REMEDIES FOR COPD

Herbal Remedies

Certain herbal remedies can be great natural treatments for COPD. If you're looking to supplement your COPD treatment plan, consider these herbal remedies:

- **Eucalyptus**—helps break up congestion and expel phlegm.
- **Ginger**—has many benefits, such as breaking down mucus, improving circulation to the lungs and reducing inflammation. Try boiling chopped, fresh ginger in water, straining out the ginger and drinking it with honey as a tea.
- **Oregano**—contains carvacrol and rosmarinic acid, which are natural decongestants and antihistamines. Try adding some fresh oregano to your meals for great flavor and health benefits.
- **Peppermint**—is an herb that contains menthol, which can promote the relaxation of the muscles in the respiratory tract.
- **Ginseng**—has been shown to give some people relief from COPD symptoms, including improvements in breathing and exercise tolerance.
- **Turmeric**—contains curcumin, which has the ability to improve a wide range of conditions and may have antiviral, anti-inflammatory and antioxidant effects.
- **Melatonin**—is typically known as a sleeping aid, but a study showed that melatonin helps reduce oxidative stress in people with COPD.
- **Red Sage**—has been found in certain studies to be an effective antioxidant and to help protect the lining of blood vessels from injury when oxygen is temporarily cut off and then resumed. For people who have low blood oxygen levels, red sage could offer some protection.

Remember to talk with your doctor about these herbal supplements and natural treatments for COPD before changing your COPD treatment plan.

Diet and Exercise

Many people with COPD experience difficulties with poor nutrition. In fact, while being overweight adds extra pressure to your lungs and body, many people with COPD are underweight. It takes more energy for people with COPD to breathe than people with normal lungs. **Eating a healthy diet that is rich in a variety of foods can help you maintain a healthy weight.**

While exercise is challenging for people with COPD, studies have shown that getting enough exercise helps people improve their exercise tolerance. It's understandable to be concerned about exercising, especially when difficulty breathing occurs. However, **not exercising can cause your muscles to lose their strength and make your overall health decline.** Talk with your doctor about what kinds of exercise is right for you. Ask about gentle exercises like yoga, Tai Chi and walking.

Vitamins

For people with COPD, making sure you receive enough vitamins is vitally important. While it's best to receive your nutrients from food, sometimes vitamin supplements may be needed. **Here are some vitamins that people with COPD need to know about:**

- **Vitamin D**—is fat-soluble and stored in your liver and fatty tissues. Naturally present in many foods, like salmon, mackerel, beef liver, egg yolks, yogurt, milk and cheese, it's also available as a vitamin supplement. For people with COPD, vitamin D deficiency can be common. Your doctor can help

you determine if you need more vitamin D, how much to take and for how long.

- **Vitamin C**—is a water-soluble vitamin. You can increase your intake of vitamin C by eating oranges and other citrus fruits, dark leafy green vegetables, broccoli, berries and tomatoes.
- **Vitamin A**—is another fat-soluble vitamin and is important for normal vision and a healthy immune system. Vitamin A can be found in salmon and other fatty fish, dairy products, fruits like mangoes and cantaloupe, carrots, squash, broccoli and green leafy vegetables.
- **Vitamin E**—is also fat-soluble and is naturally present in vegetable oils, cereals, meat, poultry, eggs, fruit and vegetables. Vitamin E can boost the immune system, is good for the blood vessels and helps protect against cell damage.

If you take certain medications or have certain conditions, your doctor may want you to avoid certain foods even though they contain good vitamins. While all of the above vitamins are available as supplements in local stores, it's important to discuss taking supplements with your doctor before trying them.

Antioxidants

Many vitamins, herbs and foods contain antioxidants. Antioxidants are naturally occurring or synthetic substances that help protect cells from free radicals, which are highly reactive compounds. **Free radicals can damage cells, and antioxidants can prevent damage from them.**

To put it simply, oxidants are capable of causing an interaction between oxygen molecules and other substances, which is known as oxidation. A peeled apple that turns brown is an example of oxidation.

Oxidation also happens in living tissues, including in the lungs. Oxidants from inside the body include free radicals released from your cells, and oxidants from outside your body include cigarette smoke and air pollution.

When the balance between oxidants and antioxidants shifts towards too many oxidants, oxidative stress occurs. In fact, oxidative stress has been linked to inflammation of the lungs' airways. However, **increasing your antioxidants may help reduce oxidative stress and promote better lung function.**

Try antioxidant-rich food sources to help maintain a healthy diet and boost your nutrition naturally. **Some great foods with antioxidants include**

- Kidney beans, red beans, pinto beans, black beans
- Red Delicious apples, Granny Smith apples, Gala apples
- Blueberries, cranberries, blackberries, raspberries, strawberries
- Cooked Russet Potatoes
- Plums and black plums
- Artichoke hearts
- Olive Oil
- Green tea
- Cherries
- Carrots
- Prunes
- Pecans
- Ginger
- Fish.

CONCLUSION

There is considerable interest in comorbidities associated with COPD. A patient with COPD are subjected to stressors including cigarette smoke, chronic inflammation, oxidative stress, hypoxia as well as repeated exacerbations with marked acute local and systemic inflammation and hypoxia. Currently, there are a number of ongoing studies investigating the pathogenesis of atherosclerosis in airways disease.

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