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RESEARCH ARTICLE

ROLE OF NUTRITION IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A REVIEW

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Abstract

Chronic obstructive pulmonary disease which mainly affects lung due to the inflammation in the airway and alveoli over a long period of time causing excessive mucus production and airway trapping. The majority of COPD patients are affected with nutrition depletion due to their systemic inflammation and multiple other factors. Malnutrition in Chronic Obstructive Pulmonary Disease affects the lung function, tolerance in exercise, and Quality Of Life. The early evaluation and treatment of malnutrition in COPD might aid in improving the morbidity and mortality.

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Introduction:-

The Global initiative for chronic obstructive lung disease (GOLD) defines chronic obstructive pulmonary disease is a common preventable and treatable disease, characterized by persistent respiratory symptoms and airflow limitations. It affects 5% to 6% of the world population⁽¹⁾. It is the major cause of mortality and morbidity in worldwide projected as third leading cause of death, causing 3.23 million deaths in 2019. Over 80% of these deaths occurred in low- and middle-income countries (LMIC)⁽²⁾. 25-40% of COPD Patients are said to be at risk of malnutrition⁽³⁾.

Chronic bronchitis and Emphysema are the disease entities that may be present in varying combination in individuals with COPD. This disease condition limits the daily activities as well as the nutrition status in the patients.

Due to the chronic inflammation, improper intake and due to other factors the patient with the COPD get malnourished and malnutrition also in turn affects the disease. This review briefly discuss the factors affecting the nutrition, effect of malnutrition and nutritional supplementation in COPD.

Factors Affecting Nutrition In COPD:-

Majority of the people affected with COPD gets malnourished as the severity of the disease gets progressed and vice versa with a vicious cycle.

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In COPD the body composition, immune status, metabolism change, inflammation may all lead to skeletal muscle wasting and weight loss, worsening of prognosis and decreased exercise tolerance. The following are the factors that influence the nutritional status of COPD

Metabolism and caloric intake:

Hyper metabolism is common in patients with COPD because the consumption of caloric get increased due to the increased work of breathing⁽⁴⁾. Due to the decreased general physical activity the dietary intake gets reduced due to loss of appetite or dyspnea while eating Gronberg AM et al⁽⁵⁾.

Systemic inflammation:

A systemic inflammation occurs secondary to pulmonary inflammation in COPD. Inflammatory disorder caused by the increased production of inflammatory cytokines which includes interleukin-6, IL-8, chemokines and causing decreased appetite, skeletal muscle wasting and weight loss^(6,7).

Hypoxia:

Due to increased work of breathing in patients with advanced COPD the demand of oxygen get increased to the pulmonary and cardiac tissues hereby couldn't meet the requirement of oxygen to peripheral tissues causing nutritional deficiency and muscle wasting by different mechanism⁽⁸⁾.

Glucocorticoids:

Steroid is common medications used for the treatment of COPD. These drugs inhibit protein synthesis and promoting protein catabolism causing a additive oxidative stress to the patients causing nutritional depletion reduction in respiratory muscle strength on dose dependent manner⁽⁹⁾.

Adipokines:

Adipokines affects the nutritional status in COPD. The adipokines are bioactive protein secreted by adipocytes which is the primary protein that plays an important role in regulating appetite and influences the nutritional status. In the case of COPD the adipokines get dys-regulated due to the inflammation condition in COPD, which cause malnutrition⁽¹⁰⁾.

Socioeconomic:

COPD is common developing and highly population countries due to Biomass fuel, smoking, tuberculosis. These are all also the factors that causes malnutrition in general and population of majorly middle and low socioeconomic people which may add on to the burden of malnourishment⁽¹¹⁾.

Effects Of Malnutrition In COPD:-

Burak mete et al⁽¹²⁾, It has been estimated that as 35% COPD patients who are inpatients and 21% COPD patients who are outpatients are affected by malnutrition. Malnutrition has a serious consequences in a patients with COPD and is associated with a health related issues that may include⁽¹³⁾

- Decreased in respiratory function.
- Decreased in exercise tolerance.
- Increased risk of mortality.
- Longer hospital stay.
 - Increased in hospital readmissions.

Gali rimington et al⁽¹⁴⁾ said that a unintentional weight loss being masked by a normal body mass index leads to malnourishment in patients with COPD. The poor nutritional status may lead to tissue hypoxia, increased metabolism with decreased food intake, muscle weakness, aging, inflammation etc. Inadequate intake of nutrition leads to disturbances in body composition, impaired lung function, impaired muscle strength and function.

Increased gas trapping occurred in patients with malnourished COPD due to poor muscle function Peter F collins et al⁽¹⁵⁾ Decreasing in diffusing capacity in malnourished COPD when compared to non- malnourished COPD patients. The severity of COPD increased in malnourished patients. Rob cl wust et al⁽⁷⁾ The body cells that fight against infection are made up of protein. The intake of poor diet becomes difficult to built immune system to fight against infection and to repair the damage cells and causes increased risk of developing Infection⁽¹⁶⁾.

Masayuki itoh et al⁽¹⁷⁾., concluded that malnutrition in COPD caused due to the decreased dietary intake of patients with COPD and energy expenditure gets increased due to the disease state that aggravates the symptoms and exaceberations in COPD patients.

Evaluation Of Nutrition Status In COPD:-

To evaluate the nutrition status in COPD to collect.

- The complete history of the patients,
- The evaluation of dietary intake,
- Anthropometric measures which include mid-arm muscle circumference, triceps skin-fold thickness, BMI.
- FFMI should be done for evaluation of nutrition status.
- Malnutrition Universal Screening Tool

AM hunter et al⁽¹⁸⁾., If the proper nutritional assessment done to examine the nutritional status of COPD patients through anthropometric measures and BMI can intervene the progression of severity of COPD.

Body Mass Index:

BMI= weight in kilogram (Height in meters)²

In patients with malnutrition in COPD condition there was decreased BMI with increased progression of severity with increased risk of mortality. The normal BMI ranges from 18.0-24.9 kg/m². BMI with less than 21.7kg/m² are at risk of mortality⁽¹⁹⁾.

Spirometry:

FEV1 noted in PFT because there is a relation with the value of fev1 and malnutrition in COPD. Burak mete et al⁽¹²⁾ The decreased value of fev1 shows the higher risk of malnutrition. The Percentage of airflow obstruction in COPD patients might be a higher risk of malnutrition

Fat Free Mass Index:

FFM = Weight (kg)*(1-body fat/100)

FFMI = FFM (kg)/(height(m))²

FFMI is the amount of muscle mass in relation with height and weight. Decrease in FFMI value indicates decrease in muscle mass. FFMI was measured by multi frequency and 8 spot contact bioelectrical impedance in kg/m². FFMI < 15 kg/m² is common in women and FFMI < 16 kg/m² is common in men (low value).

Yuwen luo et al⁽²⁰⁾, FFMI has a significant correlation with exercise capacity, dyspnea, respiratory muscle strength and PFT could be used as predictor of COPD severity. The fat free mass is the muscle strength of the normal person helps to keep the person healthier. In condition with COPD due to systemic inflammation and other multifactorial may cause a loss in fat free mass which leads to poor quality of life. Nutritional management accordingly with FFMI may help in improving the nutritional status in COPD .

Eleni ichaki et al⁽²¹⁾, study says that FFMI shows more accurately expressing the severity of the disease.

Triceps skin fold thickness: (TSF)

Dr.sharath chandra k s et al⁽²²⁾ The triceps skin fold thickness is measured with the help of a vernier calipers it gives a prediction amount of total body fat. The thickness of the skin fold is measured with the subcutaneous fat. The triceps skin fold is measured at the back of the left arm, midway of the scapula in acromial process and the olecranon process of the ulnar. For adults the normal values for TSF are 2.6mm for men about 20% fat and 18.1mm for women about 30% fat.

Mid- upper arm circumference:

Abir hedhli et al⁽²³⁾ Prognosis and severity of the disease had a significant association with mid upper arm circumference.

To measure:

- 1) Bend the left arm find the midpoint and mark with a pen the olecranon process and acromium.
- 2) Mark the midpoint between these two marks.

3)With the arm hanging straight down, wrap a mid upper arm circumference tape around the arm at the midpoint mark.

4)Measure the value nearest to 1mm.

Normal value ranges from >23cm in males and >22cm in female indicates normal. Less than the normal value range indicates that the patient is malnourished in nutritional supplementation.

Malnutrition Universal Screening Tool:

The MUST is a 5 step screening tool used across care settings to identify adults who are at risk of malnutrition. MUST can be used as a predictor for risk of death and readmission in patients with COPD⁽²⁴⁾

Nutritional Therapy In COPD Patients:-

Nutritional therapy is highly recommended in patients with COPD to meet their requirements related with the severity of the disease. The state of the patient should assess individually according to which the diet should be give to improve the stage of disease.

Protein:

For patients with COPD to restore the respiratory muscle force a high protein diet is required and thus promotes an improvement in the immunologic function. The recommended protein value should meet 1 to 1.5g/kg of body weight per day Peter F. Collins et al⁽¹⁵⁾. A excess amount of protein should be avoided in protein diet in order to prevent the increasing respiratory symptoms only the adequate amount of protein should be recommended. Increased high protein content can also result in increased dyspnoea in condition with patients associated with increased respiratory impulse.

Carbohydrates:

The required amount of carbohydrates for patients with COPD ranges between 50% to 60% of the total energy expenditure of the patients⁽¹⁵⁾. An increasing amount of carbohydrate exceeds necessity may leads to lipo-genesis. An excess production of carbohydrates can also leads to liver steatosis. In this condition low amount of carbohydrates suggested in patients diet. Baiqiang cai MD et al⁽²⁵⁾ high carbohydrates diet is not recommended in nutrition diet for COPD patients. If a person with COPD to gain weight should eat a variety of complex carbs with a wholesome source of fat and protein. Low carbohydrates are recommended in patients with malnutrition in COPD.

Fat:

If a person to lose weight they want to replace refined carbs with complex carbs, protein and fat. Gautam rawal et al⁽²⁶⁾ High fat should also included in diet to gain weight. Foods that include vegetable oil, such as olive oil, coconut oil, and avocado oil, fish, nuts and seeds. High fat must be included in diet plan of patients with malnutrition in COPD⁽²⁵⁾

Vitamins And Minerals:

The benefits of fruits and vegetables are always high in COPD patients with chronic conditions, as they contain minerals, flavonoids, vitamins, antioxidants, and fiber. Polyunsaturated fatty acids (PUFA) have an anti inflammatory effect in chronic condition such as COPD and also in patients with malnutrition. In COPD patients the vitamin-D serum level is low. The maintenance of vitamin-D serum level improve the muscle weakness prevents from muscle fatigue Wim janssens et al⁽²⁷⁾ and vitamin-C and vitamin-E also plays important role .So to maintain the levels of vitamin-C and E also important. A small amount of nutrients and calories which improves the basic energy expenditure is necessary to gain weight in weight loss patients. A dose of multivitamin is also suggested in COPD patients every day. Lisa Ezzell et al⁽²⁸⁾., concluded that better understanding of the mechanisms leading to malnutrition in COPD patients should guide the development of improved interventions and to evaluate the nutritional status.

Conclusion:-

Malnutrition is commonly and frequently affecting in patients with Chronic Obstructive Pulmonary Disease due to multiple systemic factors. Malnutrition in COPD affects the lung function, exercise tolerance, and quality of life. The early evaluation and treatment of malnutrition in Chronic Obstructive Pulmonary Disease will aid in improving the morbidity and mortality.

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