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## CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND THE OBESE PATIENT

**Chronic Obstructive Pulmonary Disease (COPD) is a serious long-term lung disease in which the flow of air into the lungs is gradually reduced by inflammation of the air passages and damage to the lung tissue. Chronic Bronchitis and emphysema are common types of COPD. It is a complex multi system disease with multiple comorbidities and clinical problems.**

Issues include poor health status, frequent exacerbations and decreased physical activity. According to NHS England, it is the fifth biggest killer in the UK. Figures show that people living with a COPD diagnosis are mostly over the age of 40. The proportion of people living with COPD increases markedly with advancing age.

Many dietitians have had the experience of running COPD groups and programmes, with a significant number doing so in the early stages of their careers, or in general community work. Often, these groups contain a complex mix of patients from early to later stages of the disease condition. This can cause some challenges when planning and targeting these programs, due to the changing dietary needs throughout the disease progression.

For patients with COPD and other chronic lung conditions, maintaining a healthy lifestyle is crucial for managing their condition and improving symptoms. COPD has typically been considered a disease associated with malnutrition, low body weight and reduced skeletal muscle mass. Patients are at risk of malnutrition as the disease progresses.<sup>1</sup>

Cachexia is known to be a deteriorating factor for survival of patients with COPD, and treatment guidelines around nutrition screening and nutritional support are in place, but data and treatment guidelines related to COPD and obesity are limited.<sup>2</sup> Obesity, however, is becoming more common in

COPD with a prevalence that is higher than the general population.<sup>3</sup>

### THE IMPACT OF OBESITY

The role obesity plays in COPD is of important significance. Although obesity is not necessarily a risk factor for chronic respiratory diseases like COPD, there is clinical evidence that suggests an increasing influential relationship between the two.<sup>4</sup> COPD itself has a major adverse impact on patients' exercise capacity, health status and mortality. When COPD and obesity coexist, patients suffer an addition burden. Obesity lends itself to a worsening of COPD symptoms and a decrease in both exercise tolerance and quality of life.

Ventilation refers to breathing, or the inhalation and exhalation of air from the lungs. An overabundance of fat tissue, which occurs from obesity, impairs the breathing process in both adults and children. Moreover, an increased BMI is also associated with a host of other respiratory problems, including a reduction in the following pulmonary function tests such as total lung capacity, functional residual capacity and forced vital capacity (FVC).

Since carrying around excess weight increases the work of breathing, there is a direct association between obesity and shortness of breath, or dyspnoea, which is also recognised as the hallmark symptom of COPD. When COPD is coupled with obesity, COPD symptoms, namely dyspnoea, worsen.



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A recent multicentre prospective cohort study<sup>5</sup> conducted in the United States, showed obesity was prevalent among their population with COPD and was associated with worse COPD-related outcomes, ranging from quality of life and dyspnoea to restricted abilities to walk short distances and greater odds of experiencing acute exacerbations. These associations were strengthened when obesity was analysed as a dose-dependent response. Obesity in patients with COPD may contribute to a worse COPD-related course.

#### THE OBESITY PARADOX

Despite obesity being an established risk factor for poor health outcomes, paradoxically in COPD, it has been associated with improved survival and lung function. In fact, mild to moderate obesity has been associated with improved survival, improved lung function and reduced hospital admission.<sup>6</sup> In the epidemiological Copenhagen City Heart Study, obesity was associated with a 20%-34% increase in the relative risk (RR) of all-cause mortality in patients with mild-to-moderate COPD compared to normal BMI patients with comparable disease severity.<sup>6</sup> Obesity in patients hospitalised for COPD has also been shown to be associated with substantially reduced in-hospital mortality risk and the possibility of early re-admittance in retrospective chart reviews.<sup>7</sup>

This obesity paradox in COPD may be explained by a few factors. Overweight or obese patients with COPD may receive medical attention earlier (i.e. while having

better preserved expiratory flows and less hyperinflation compared with their lean counterparts). Peak oxygen consumption ( $\text{VO}_2$ ) has been found to be higher in obese patients with COPD than in their normal-BMI counterparts. Obese patients with COPD may not only have more adipose tissue, but more muscle, offering a survival advantage.<sup>8</sup>

A 2014 study<sup>9</sup> looked at the potential mechanisms behind the obesity paradox in COPD. Fat accumulation did not explain the link, but the study identified that two variables: muscle mass and exercise capacity, were both preserved in heavier patients. In fact, for COPD patients, increasing BMI may reflect higher fitness levels, greater metabolic reserve and less cachexia.<sup>10</sup> Muscle mass is a key feature for COPD patients.

The question of the obesity paradox is still being examined. A 2016 dose response meta-analysis,<sup>11</sup> examining body mass indexes and mortality in COPD, found a significant nonlinear relationship between BMI and mortality of COPD patients. COPD patients with BMI of  $<21.75\text{kg/m}^2$  had a higher risk of death. Moreover, an increase in the BMI resulted in a decrease in the risk of death. The risk of death was lowest when BMI was  $25\text{-}30\text{kg/m}^2$ . The BMI was not, however, associated with all-cause mortality when BMI was  $>32\text{kg/m}^2$ . The study findings indicated that overweight is associated with a lower risk of all-cause mortality among patients with COPD, whereas underweight is associated with a higher risk of all-cause mortality in these patients. However, there was limited evidence to support

the association between obesity and the risk of all-cause mortality in patients with COPD.

These findings and possible mechanisms to explain the obesity paradox suggest that there is much more to it than weight alone. This creates a conundrum for clinicians - we see people who need to lose weight to reduce their risk of other chronic diseases, but we don't know the effect that this has on COPD outcomes.

#### MANAGING WEIGHT IN COPD PATIENTS WITH A HIGHER BMI

The optimal management approaches to obesity and COPD are unknown; there are no evidenced-based recommendations for obese COPD management. Consideration of all factors must be taken into account, carefully weighing up evidence supporting weight loss to improve quality of life, lung function and exercise capacity with that supporting maintenance of weight for long-term survival. Despite this, many clinicians encourage obese patients to reduce their weight. This may be deleterious, depending on the method taken, because weight-loss interventions can reduce both fat and muscle mass. Hence, any intervention for obese COPD individuals must aim to preserve muscle mass.<sup>12</sup> Eating plans should meet core nutritional requirements and limit exposure to foods that may cause inflammation.

A recent pilot study from the University of Newcastle<sup>12</sup> has looked into incorporating weight loss regimes for obese COPD patients which maintain muscle mass. Patients were offered a calorie-controlled diet with meal replacement therapy and nutritional counselling, in addition to a resistance exercise training program delivered by a physiotherapist. The majority of trial participants had moderate to severe disease COPD. After 12 weeks, they had achieved an average weight loss of 6% and significant fat reduction without compromising muscle composition. Around 70% achieved a clinically significant improvement in their health status. Participants achieved major quality of life improvements. They improved their exercise capacity, a real predictor of COPD mortality, and they became stronger. This suggests that, at least for short term outcomes, weight loss interventions could lead to improved COPD outcomes which oppose the obesity paradox.

#### Suggested strategies for obese and overweight COPD patients:

- Overweight and obese patients should be supported individually, or, in the case of group programs, in their own groups and not included in mixed groups with later stage or underweight patients.
- Patients should be part of the screening protocols in place for all COPD patients and should be monitored for changes in circumstances that may be associated with disease progression (including breathing issues, appetite changes, functional changes, fatigues, chewing or swallowing difficulties).
- COPD patients with a BMI  $>32\text{Kg/m}^2$  should be considered for weight loss in order to improve symptoms and quality of life.
- Patients who are overweight, but with BMI  $<32\text{Kg/m}^2$ , should be managed using a weight maintenance focus whilst using treatment outcome measures, such as diet quality, respiratory and exertion measures and other quality of life indices.
- Dietary advice should follow balanced diet recommendations using the DOH eat well plate model, counselling models and portion guides.
- Dietary advice should include advice on potential 'at risk' nutrients and nutrients of importance in COPD, such as adequate protein, omega-3 fats, vitamin D and calcium.
- Weight loss goals should be achieved at a slow rate with a goals negotiated around 5-10% body fat loss or to achieve a BMI  $<32\text{Kg/m}^2$ .
- Weight reduction must be combined with resistance exercises designed to maintain muscle mass.