Review Articles

Taste Perception Preservation In Chronic Obstructive Pulmonary Disease: Narrative Review

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Abstract:

Taste perception alterations are prevalent among COPD patients, affecting up to 79% of them and influencing their food preferences, potentially impacting dietary quality. Studies indicate that COPD patients often experience reduced appetite and limited dietary diversity due to these taste changes. Pulmonary rehabilitation has emerged as a potential solution, as it has shown promising results in enhancing taste sensitivity for salty, sweet, and bitter tastes. The use of High-Flow Nasal Cannula (HFNC) treatment and long-term oxygen therapy in COPD patients may also play a role in influencing taste and smell perception, with HFNC possibly leading to improvements. However, the impact of smoking on taste perception remains variable. Altered taste perception may lead to reduced appetite, resulting in inadequate nutrient intake and aversions to specific food groups, further compromising dietary quality. While zinc supplementation has been effective in addressing taste and smell dysfunctions, there is a lack of specific evidence regarding its use for COPD patients with taste and smell impairments. Although pulmonary rehabilitation shows promise in improving taste sensitivity, more research is required to explore additional interventions for COPD patients' taste perception alterations. Addressing these taste changes and their effects on dietary intake is crucial to enhance the nutritional status and overall health of COPD patients, particularly among older individuals with the condition.

Keywords: Chronic Obstructive, Pulmonary Disease, Taste perception.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD), a complex respiratory disease characterized by airflow limitation, witnessed a considerable surge in prevalence. In 1990, there were about 227.3 million cases of COPD among individuals aged 30 years or older. By 2010, the number of COPD cases had risen to 384 million, with a global prevalence of 11.7%. The Americas had the highest prevalence, with 13.3% in 1990 and 15.2% in 2010 [1]. In Australia, it resulted in about 32 losses of healthy years due to both premature death and living with disability among each 1000 elderly in 2022 [2]. Beyond its impact on lung function, COPD can also affect other aspects of health, including dietary intake [3]. Due to increased need for energy due to breathing efforts, they may require higher calorie intake to maintain energy balance and most are experiencing food-related challenges [4]. Oral respiration, aerophagia, prolonged mucus secretion, dyspnea, and fatigue can alter dietary intake in COPD patients [5]. This can be moderated by the effect of these changes on the chemosensory of tastes. A considerable number of smoker individuals in the general population experience compromised olfactory and gustatory function, with significantly raising the likelihood of olfactory impairment [6]. Taste sensation is flexible and can change with age, health conditions, and dietary habits. Taste perception is influencing food choices and dietary behavior chemosensory plasticity may affect food intake and contribute to changes in body composition [7]. A study found a general lowering of taste sensitivity with increasing weight, except for the taste of fat, and highlighted the potential implications of individual taste preferences in weight management and dietary planning [8]. The presence of COPD symptoms can further complicate eating behavior. Shortness of breath and fatigue during meals can negatively impact the overall eating experience for patients. The difficulty in eating or swallowing may prompt COPD patients to modify their food choices, portion sizes, and meal frequency. These adjustments may inadvertently impact the overall nutritional content of their diet, potentially affecting dietary quality and nutritional status. Therefore, a comprehensive study investigating the impact of COPD on taste sensation and dietary alterations is warranted. Moreover, the study will investigate the role of chemosensory plasticity in COPD patients' dietary changes. By examining the relationship between the severity of COPD, the degree of taste alterations, and dietary modifications, the research can show whether taste perception plays a role in shaping dietary behaviors in these patients.

Taste perception in COPD individuals

A study suggests that up to 79% of COPD patients experienced hyposmia or anosmia [9]. Korea National Health and Nutrition Examination Survey showed a higher incidence of olfactory dysfunction in individuals with restrictive or obstructive pulmonary function compared to subjects with normal function of lungs [10]. A cross-sectional comparative study was to investigate taste threshold differences between underweight and normal-weight men with COPD and explore potential associations between taste thresholds and COPD-related biochemical data. The results revealed that underweight men had a significantly higher bitter taste threshold compared to normal-weight men, and there were negative correlations between absolute bitter taste threshold and bicarbonate and Pco2 levels. The findings highlight the importance of considering taste alterations in patients with COPD when designing individualized meal plans to target weight goals [11]. The objective of a study was to assess and compare oral and oropharyngeal sensory function in adults with COPD and healthy controls, revealing higher incidences of inhaled medication use and xerostomia in the COPD group, as well as impaired oral thermal sensation and a decline in gustatory sensation associated with age in the COPD participants [12]. Malnourished COPD patients have worsened taste perception of food [13]. Malnutrition is a common

concern in COPD patients, and inadequate nutrient intake can contribute to altered taste perception. Poor nutritional status may lead to deficiencies in certain vitamins and minerals, which can, in turn, affect taste sensitivity. Addressing malnutrition and ensuring adequate nutrient intake is essential to potentially mitigate taste perception alterations in COPD patients.

long-term exposure to fine particulate matter (PM2.5) is associated with anosmia, providing evidence that ambient PM2.5 could be a widespread and modifiable risk factor for the loss of sense of smell [14]. PM2.5 is shown to be a marker of exposure to tobacco smoke [15]. Even in other respiratory diseases, like chronic rhinosinusitis, common cold, and COVID-19, changes in sensation of bitter or sweet stimulus are obviously reported [16,17]. In a study, changes in taste sensation were observed in 31% of the individuals with idiopathic pulmonary fibrosis and in 37% of those diagnosed with sarcoidosis [18].

Smoking is reported to change sensation of different specific taste stimulus. Korean Community Health Survey data shows increased sodium intake in smokers [19]. But most evidence is about an association between cigarette smoking and the bitter taste threshold variable [20]. Current smokers in US National Health and Nutrition Examination Survey showed increased bitter taste ratings, suggesting taste changes related to smoking may impact diet and weight status [21]. Altered taste perception in COPD patients can arise from various factors such as inflammation, medications, or systemic effects related to the disease [22]. In a case report, nifedipine-induced dysgeusia was initially mistaken for depression, emphasizing the need to consider non-psychiatric causes for symptoms like decreased appetite. This case report shows how taste disorders can affect appetite [23]. The primary taste cortex in the rostral insula and adjoining frontal operculum provides independent representations of taste, temperature, and texture of food, while in the orbitofrontal cortex, these sensory inputs are combined with olfactory and visual inputs, influencing the pleasantness of taste and smell [24]. Loss of the input taste and smell stimuli can lead to poor appetite and dietary choices, while compensating for these sensory losses with flavor-enhanced foods can improve palatability, intake, and overall nutritional status [25].

Taste perception preservation in COPD

In a study of Dutch older adults aged 65-93 years, self-reported poor taste was associated with poor appetite, while self-reported poor taste and smell were consistently associated with poorer dietary quality [26]. COPD patients may also experience changes in taste preferences [9], leading them to favor certain types of foods over others. This shift in taste preferences could have significant implications for dietary quality, as their food choices may no longer align with a well-balanced and nutritious diet [25,26]. A study aimed to assess the impact of pulmonary rehabilitation on taste sensitivity in patients with COPD by conducting taste tests before and after the pulmonary rehabilitation. Patients showed significant improvements in recognition thresholds for salty, sweet, and bitter tastes, indicating that pulmonary rehabilitation may enhance taste sensitivity in COPD patients [27]. A qualitative survey suggests that the use of High-Flow Nasal Cannula (HFNC) treatment in COPD reduces airways dryness and may lead to improvements in their ability to taste and smell [28]. In a study in Japan, taste perception (salty, sweet, bitter, and umami) significantly changed after the completion of the pulmonary rehabilitation program [29]. In another study, researchers hypothesized that long-term oxygen therapy via nasal cannulas in subjects with COPD might lead to impaired sense of smell and taste; however, the results showed that the use of long-term oxygen did not affect their sense of smell and taste, while smoking had variable effects on these sensory perceptions [30]. In a case report of COPD related weight loss, patient's taste impairments, including loss of appetite and taste deterioration, posed significant challenges to their

nutritional intake and required specialized dietary recommendations [31]. Reduced taste perception seems to have a robust correlation with mortality among acutely admitted elderly individuals [32], that should be considered for older COPD individuals. One notable consequence of altered taste perception in COPD patients is a potential reduction in appetite. Reduced appetite can result in decreased food intake and, consequently, inadequate nutrient consumption. Moreover, the changes in taste perception may lead to a dislike for certain foods, potentially causing these patients to avoid specific food groups, thereby limiting their nutrient diversity and compromising their dietary quality. While zinc supplementation is shown to help improving taste and smell dysfunctions [33], there is no study about zinc supplementation for COPD patients with taste and smell impairments.

Conclusion

In conclusion, altered taste perception is a prevalent and significant issue among COPD patients, affecting a substantial proportion of individuals with the condition. These taste changes can lead to preferences for certain foods, which may impact dietary quality and result in reduced appetite and limited dietary diversity. More research is needed to explore additional interventions for addressing taste perception alterations in COPD patients. It is vital to recognize the potential consequences of altered taste perception, as it can lead to inadequate nutrient consumption and aversions to certain food groups, further compromising the overall dietary quality of COPD patients. By understanding and managing taste perception changes, we can enhance the overall health and quality of life for COPD patients.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

We have no conflicts of interest to disclose.

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Table & Figure:

First Author	Study Design	Study Objective	Conclusion
W M Thorstensen	Cross-sectional	Assess olfaction in COPD and control group and its association with other covariates.	COPD is associated with olfactory dysfunction, and underlying mechanisms need to be explored.
Ji-Sun Kim	Cross-sectional	Investigate the relationship between pulmonary function and olfactory dysfunction in middle-aged and older adults.	Olfactory dysfunction is more frequent in patients with restrictive or obstructive pulmonary function. Early olfactory testing may improve the quality of life in these patients.
K Chapman-Novakofski	Cross-sectional comparative	Compare taste threshold differences between normal-weight and underweight men with COPD and their association with COPD-related biochemical data.	Underweight men with COPD have a higher bitter taste threshold, and biochemical data are associated with taste thresholds.
Fernanda Borowsky da Rosa	Descriptive comparative	Describe and compare oral and oropharyngeal sensory function in adults with COPD and healthy controls.	Most oral and oropharyngeal sensory measures remain intact in COPD patients, but oral thermal sensation is impaired in COPD, and gustatory sensation declines with age.
J Nordén	Cross-sectional	Investigate nutrition impact symptoms in COPD patients and their relationship with fat-free mass depletion.	NIS are common in COPD patients, and depleted patients have more severe symptoms. Preventing and managing NIS could help combat malnutrition in COPD patients.
Kumiko Ito	Single-group intervention trial	Compare taste sensitivity before and after pulmonary rehabilitation in COPD patients.	Pulmonary rehabilitation may improve taste sensitivity in patients with COPD.
Storgaard	Qualitative study	Explore COPD patients' experience with home-based health treatments, specifically home high flow nasal cannula treatment (HFNC).	Patients experienced lower work of breathing, reduced symptoms, improved quality of sleep, and increased activity of daily living with HFNC treatment.

Virendra Singh	**Interventional**	**Evaluate the effect of domiciliary pulmonary rehabilitation in COPD patients.**	**Domiciliary pulmonary rehabilitation resulted in significant improvement in the quality of life and exercise tolerance, despite no improvement in FEV1.**