UNIVERSIDADE FEDERAL DE CIÊNCIAS DA SAÚDE DE PORTO ALEGRE
PROGRAMA DE PÓS-GRADUAÇÃO DE CIÊNCIAS DA NUTRIÇÃO

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Padrões dietéticos e Doença pulmonar obstrutiva crônica: mapeamento da literatura e associação com desfechos clínicos em pacientes ambulatoriais

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Dissertação de Mestrado apresentada ao Programa de Pós-Graduação em Ciências da Nutrição da Universidade Federal de Ciências da Saúde de Porto Alegre, como requisito parcial para obtenção do título de Mestre em Ciências da Nutrição.

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FORMATO DA DISSERTAÇÃO

Esta dissertação foi desenvolvida com base na Normativa de instrução para trabalho final do Programa de Pós-graduação em Ciências da Nutrição da Universidade Federal de Ciências da Saúde de Porto Alegre, a qual pode ser consultada no site institucional (https://www.ufcspa.edu.br/index.php/stricto-sensu/ciencias-da-nutricao/arquivos).

Os produtos desta dissertação compreendem dois artigos científicos originais, conforme detalhado abaixo:

- **Dietary patterns and risk of Chronic Obstructive Pulmonary Disease (COPD) and clinical outcomes in diagnosed patients: A scoping review** - publicado no periódico Respiratory Medicine (ISSN 0954-6111) fator de impacto 3,7 qualis A2.
- **Adherence to the Healthy Eating Index 2015 and clinical outcomes in COPD patients: A cross-sectional study -** o qual será submetido para pubmicação no periódico Respiratory Medicine (ISSN 0954-6111) fator de impacto 3,7 qualis A2.

RESUMO

Introdução e Objetivos: A Doença Pulmonar Obstrutiva Crônica (DPOC) é uma condição respiratória crônica que afeta milhões de pessoas em todo o mundo, sendo responsável por elevada morbimortalidade e impacto significativo na qualidade de vida dos pacientes. Apesar dos avanços no diagnóstico e manejo da doença, ainda existem lacunas importantes no entendimento de fatores modificáveis, como a alimentação, no desenvolvimento e na progressão da DPOC. Evidências emergentes sugerem que padrões dietéticos saudáveis, como a dieta mediterrânea e o Índice de Alimentação Saudável (HEI), podem desempenhar um papel benéfico na função pulmonar, qualidade de vida e desfechos clínicos em pacientes com DPOC. No entanto, a literatura atual carece de dados robustos e consistentes sobre a associação entre a qualidade da dieta e os desfechos clínicos, incluindo capacidade funcional, gravidade da doença e sintomas. Diante disso, é crucial aprofundar a investigação sobre o impacto da alimentação no manejo da DPOC. Esta dissertação teve por objetivo mapear a literatura acerca da relação entre padrões alimentares (PAs) e a presença de DPOC e de desfechos clínicos em portadores da doença e avaliar a associação entre a qualidade da dieta, mensurada através do *Healthy Eating Index-2020* (HEI-2020) e desfechos clínicos em pacientes ambulatoriais com DPOC.

Métodos: Foram conduzidos dois estudos para responder aos objetivos da presente dissertação: uma revisão de escopo e um estudo transversal. A revisão de escopo foi conduzida seguindo a metodologia do Instituto Joanna Briggs (JBI), com registro na plataforma *Open Science Framework* e reportada de acordo com o roteiro de relato PRISMA-ScR. A busca da literatura foi realizada nas bases PubMed, Scopus, Embase e Web of Science, utilizando termos relacionados ao contexto (DPOC) e ao conceito (padrões alimenaes). Não houve restrição de idioma ou data de publicação. Dois revisores independentes analisaram os títulos, resumos e textos completos, com apoio das ferramentas Rayyan® e Endnote®, resolvendo possíveis divergências por meio de um terceiro revisor. Os dados foram extraídos utilizando um formulário padronizado no RedCap®, coletando informações sobre objetivos, métodos, características da amostra, instrumentos de avaliação da dieta e resultados. A qualidade metodológica dos estudos foi avaliada pela Escala de Newcastle-Ottawa (NOS). A análise incluiu agrupamento dos PAs como saudáveis ou não saudáveis, com dados descritos por frequência relativa e absoluta para variáveis categóricas e médias ou medianas para contínuas. O estudo transversal foi realizado com pacientes com DPOC atendidos consecutivamente em um ambulatório de um hospital no sul do Brasil, entre janeiro de 2019 e julho de 2024, com

interrupção durante a pandemia de COVID-19. O projeto foi aprovado pelo Comitê de Ética (nº 6.690.341 os participantes assinaram o termo de consentimento, sendo elegíveis se idade superior a 18 anos, com diagnóstico confirmado de DPOC por espirometria, sem aconselhamento dietético nos 6 meses anteriores e capazes de preencher o registro alimentar de 3 dias. Foram excluídos pacientes com outras doenças pulmonares e aqueles com ingestão energética fora do intervalo de confiança de 90% da distribuição do consumo de calorias na amostra estudada. Foram coletados dados cínicos, nutricionais e sócio-demográficos para caracterização da amostra. O consumo alimentar foi avaliado por 3 dias de registro alimentar e a qualidade da dieta avaliada pelo HEI-2020, sem o componente "ingestão de sódio", sendo os pacientes agrupados de acordo com os tercis do escore em "baixo HEI-2020", "médio HEI-2020" e "alto HEI-2020". Os desfechos de interesse incluíram severidade da DPOC de acordo com os critérios GOLD, teste de caminhada de 6 minutos, qualidade de vida avaliada pelo questionário Saint George, gravidade da dispneia avaliada pela escala MC modificada e prognóstico avaliado pelo índice BODE. A análise estatística foi realizada no software R por meio dos testes ANOVA, Kruskal-Wallis, e regressão logística ajustada para fatores clínicos relevantes.

Resultados: Foram incluídos 24 estudos na revisão de escopo, sendo que 83,3% investigaram o papel de PAs na etiologia da DPOC, enquanto 16,7% analisaram os desfechos relacionados à saúde em portadores de DPOC. Questionários de frequência alimentar (75%) foram frequentemente empregados para avaliação do consumo alimentar. 67% estudos avaliaram PAs definidos a priori, com foco na Dieta Mediterrânea (MedDiet) e no HEI, enquanto 33,3% analisaram PAs definidos a posteriori, representados principalmente pelos padrões "Dieta prudente" e "dieta tradicional". 60% dos estudos demonstraram associações significativas entre PAs e risco/ chances de DPOC. No entanto, os estudos que examinaram PAs e desfechos em pacientes com DPOC apresentarem resultados inconsistentes. Foram incluídos no estudo transversal 99 pacientes elegíveis (63,6% mulheres, 67,2 ± 8.4 anos, 81,8% de etnia auto relatada branca, 86,9% ex-tabagista). Os estágios GOLD mais frequentes foram 3 (34,3%) e 2 (33,3%), e um terço da amostra apresentou o fenótipo de exacerbador (34,4%). A média do escore HEI-2020 foi 56,55 ± 8,43. Não foram observadas diferenças significativas na gravidade da DPOC, intensidade da dispneia, qualidade de vida, capacidade funcional ou frequência do fenótipo de exacerbador entre os tercis de qualidade dietética. No entanto, pacientes com pior prognóstico foram mais frequentes ($p = 0,047$) no primeiro (51,5%) e no terceiro (48,5%) tercis em comparação com o segundo tercil (30,3%). Essa associação, no entanto, não foi mantida na

análise multivariada [OR (segundo tercil) = 2,29; IC 95%: 0,71–7,38; OR (terceiro tercil) = 0,54; IC 95%: 0,17–1,69].

Conclusões: O mapeamento da literatura sugere que padrões dietéticos saudáveis estão associados à menor chance de indivíduos apresentarem DPOC, embora a relação entre desfechos clínicos e adesão à padrões dietéticos em portadores de DPOC tenha sido pouco explorada até o momento. Em estudo envolvendo amostra de pacientes com DPOC em acompanhamento ambulatorial, a qualidade da dieta avaliada pelo HEI-2020 não foi associada à severidade do DPOC, qualidade de vida, dispneia, capacidade funcional e prognóstico, possivelmente pelo baixo escore do índice evidenciada entre os participantes do estudo. O conjunto de evidências reforça a necessidade de estudos futuros explorando a relação entre padrões dietéticos e desfechos clínicos nessa população.

Palavras-chave: DPOC, qualidade da dieta, padrões alimentares.

ABSTRACT

Rationale and Objectives: Chronic Obstructive Pulmonary Disease (COPD) is a chronic respiratory condition that affects millions of people worldwide, leading to high morbidity and mortality rates and significantly impacting patients' quality of life. Despite advances in the diagnosis and management of the disease, important gaps remain in understanding modifiable factors, such as diet, in the development and progression of COPD. Emerging evidence suggests that healthy dietary patterns, such as the Mediterranean Diet and the Healthy Eating Index (HEI), may play a beneficial role in pulmonary function, quality of life, and clinical outcomes in COPD patients. However, the current literature lacks robust and consistent data on the association between diet quality and clinical outcomes, including functional capacity, disease severity, and symptoms. Therefore, it is crucial to investigate the impact of diet on COPD management. This dissertation aimed to map the literature regarding the relationship between dietary patterns (DP) and the presence of COPD, as well as clinical outcomes in COPD patients, and to evaluate the association between diet quality, measured by the Healthy Eating Index-2020 (HEI-2020), and clinical outcomes in outpatient COPD patients.

Methods: Two studies were conducted to address the objectives of this dissertation: a scoping review and a cross-sectional study. The scoping review was conducted following the Joanna Briggs Institute (JBI) methodology, with registration on the Open Science Framework platform and reporting according to the PRISMA-ScR guidelines. The literature search was performed in the PubMed, Scopus, Embase, and Web of Science databases using terms related to the context (COPD) and the concept (dietary patterns). No restrictions were applied regarding language or publication date. Two independent reviewers analyzed the titles, abstracts, and full texts, with support from Rayyan® and Endnote® tools, resolving discrepancies through a third reviewer. Data were extracted using a standardized form in RedCap®, collecting information on objectives, methods, sample characteristics, diet assessment instruments, and outcomes. The methodological quality of the studies was assessed using the Newcastle-Ottawa Scale (NOS). The analysis included the classification of dietary patterns as healthy or unhealthy, with data described by relative and absolute frequencies for categorical variables and means or medians for continuous variables. The cross-sectional study was conducted with COPD patients consecutively attending an outpatient clinic at a hospital in southern Brazil between January 2019 and July 2024, with a break during the COVID-19 pandemic. The project was approved by the Ethics Committee (No. 6.690.341), and participants signed the consent form. Patients

were eligible if they were older than 18 years, had a confirmed diagnosis of COPD by spirometry, had not received dietary counseling in the previous 6 months, and were able to complete a 3-day food diary. Patients with other pulmonary diseases and those with energy intake outside the 90% confidence interval of the calorie distribution in the sample were excluded. Clinical, nutritional, and socio-demographic data were collected for sample characterization. Dietary intake was assessed using a 3-day food record, and diet quality was evaluated using the HEI-2020, excluding the "sodium intake" component. Patients were grouped according to tertiles of the HEI-2020 score as "low HEI-2020," "medium HEI-2020," and "high HEI-2020." The outcomes of interest included COPD severity according to GOLD criteria, 6-minute walk test, quality of life assessed by the Saint George Questionnaire, dyspnea severity assessed by the modified MC scale, and prognosis evaluated by the BODE index. Statistical analysis was performed using R software with ANOVA, Kruskal-Wallis tests, and logistic regression adjusted for relevant clinical factors.

Results: 24 studies were included in the scoping review, with 83.3% investigating the role of dietary patterns in the etiology of COPD, while 16.7% examined health-related outcomes in COPD patients. Food frequency questionnaires (75%) were frequently used for dietary assessment. Sixty-seven percent of the studies evaluated a priori-defined dietary patterns, focusing on the Mediterranean Diet (MedDiet) and the HEI, while 33.3% analyzed a posteriori-defined dietary patterns, primarily represented by the "Prudent Diet" and "Traditional Diet" patterns. Sixty percent of the studies showed significant associations between dietary patterns and COPD risk/odds. However, studies examining dietary patterns and outcomes in COPD patients showed inconsistent results. In the cross-sectional study, 99 eligible patients were included (63.6% women, 67.2 ± 8.4 years, 81.8% self-reported white ethnicity, 86.9% ex-smokers). The most frequent GOLD stages were 3 (34.3%) and 2 (33.3%), and one-third of the sample exhibited the exacerbator phenotype (34.4%). The mean HEI-2020 score was 56.55 ± 8.43. No significant differences in COPD severity, dyspnea intensity, quality of life, functional capacity, or exacerbator phenotype frequency were observed across tertiles of diet quality. However, patients with a worse prognosis were more frequent ($p = 0.047$) in the first (51.5%) and third (48.5%) tertiles compared to the second tertile (30.3%). This association, however, was not retained in multivariate analysis [OR (second tertile) = 2.29; 95% CI: 0.71–7.38; OR (third tertile) = 0.54; 95% CI: 0.17–1.69].

Conclusions: The literature mapping suggests that healthy dietary patterns are associated with a lower likelihood of individuals developing COPD, although the relationship between clinical outcomes and adherence to dietary patterns in COPD patients has been understudied. In a study involving a sample of outpatients with COPD, diet quality assessed by the HEI-2020 was not associated with COPD severity, quality of life, dyspnea, functional capacity, or prognosis, possibly due to the low HEI score observed among study participants. The body of evidence reinforces the need for future studies exploring the relationship between dietary patterns and clinical outcomes in this population.

Keywords: COPD, dietary patterns, diet quality.

SUMÁRIO

LISTA DE ABREVIATURAS

Termos em português

A1AT – Alfa-1-Antitripsina

BODE: Índice de Massa Corporal, Obstrução, Dispneia e Exercício

CVF: Capacidade Vital Forçada

DPOC: Doença Pulmonar Obstrutiva Crônica

VEF_1: Volume Expiratório Forçado no 1º segundo

GOLD: Global Initiative for Chronic Obstructive Lung Disease

HEI: Índice de Alimentação Saudável

IMC: Índice de Massa Corporal

Kcal: Quilocaloria

DPOC – Doença Pulmonar Obstrutiva Crônica

FAM – Força do Aperto de Mão

IC – Intervalo de Confiança

IMC – Índice de Massa Corporal

IMLG – Índice de Massa Livre de Gordura

Kg – quilogramas

mL – mililitros mm

TC6M – Teste de Caminhada de Seis Minutos

Termos em inglês

6MWT – Six-Minute Walking Test

BMI – Body Mass Index

BODE – Body mass index, airflow Obstruction, Dyspnea, and Exercise

CI – Confidence Interval

COPD – Chronic Obstructive Pulmonary Disease

GOLD – Global Initiative for Chronic Obstructive Lung Disease

mMRC – Modified Medical Research Council

MD – Mean Difference

NOS – Newcastle-Ottawa Scale

PRISMA-ScR: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews

SGRQ – Saint George's Respiratory Questionnaire

SMD – Standardized Mean Difference

WMD – Weighted Mean Difference

FUNDAMENTAÇÃO TEÓRICA

1. Doença pulmonar obstrutiva crônica

1.1. Definição, fatores de risco e sintomas

A Doença Pulmonar Obstrutiva Crônica (DPOC) é uma condição pulmonar heterogênea e progressiva, caracterizada por limitação persistente do fluxo aéreo associada a uma resposta inflamatória crônica das vias aéreas e dos pulmões devido à inalação de partículas ou gases nocivos. Segundo o relatório *Global Initiative for Chronic Obstructive Lung Disease* 2024 (GOLD), a DPOC é uma doença comum, prevenível e tratável, que se manifesta principalmente por sintomas respiratórios crônicos, como dispneia, tosse e produção de escarro, além de exacerbações agudas que podem piorar a qualidade de vida e aumentar a morbidade e mortalidade (1-3).

Resultado de uma complexa interação entre fatores genéticos e ambientais, a DPOC se desenvolve ao longo do tempo, causando danos aos pulmões. Os principais fatores de risco ambientais incluem o tabagismo, que é o principal causador de DPOC, e a inalação de partículas tóxicas e gases provenientes da poluição do ar. Essas partículas e gases, encontrados em ambientes poluídos ou em locais com ventilação inadequada, desencadeiam uma resposta inflamatória crônica nos pulmões, a qual leva à destruição do tecido pulmonar e à obstrução das vias aéreas. Além dos fatores ambientais, os fatores genéticos também desempenham um papel significativo no desenvolvimento da DPOC. Um exemplo bem documentado é a deficiência de alfa-1 antitripsina, uma proteína que protege os pulmões da destruição por enzimas proteolíticas. Indivíduos com essa deficiência são mais suscetíveis a desenvolver DPOC, especialmente se expostos a irritantes pulmonares como o fumo (1,4,5).

A fisiopatologia da DPOC é complexa e multifatorial, envolvendo três processos principais: inflamação crônica, desequilíbrio enzimático e estresse oxidativo, que, juntos, contribuem para as alterações estruturais e funcionais nos pulmões. Inicialmente, a exposição a irritantes, partículas e gases nocivos, como a fumaça do tabaco e poluentes ambientais leva a uma resposta inflamatória nos pulmões, envolvendo diferentes células do sistema imunológico. Macrófagos, neutrófilos e linfócitos são ativados e migram para as vias aéreas, o parênquima pulmonar e os vasos sanguíneos pulmonares. Esses leucócitos liberam uma variedade de mediadores inflamatórios, incluindo citocinas e quimiocinas, que perpetuam e amplificam a resposta inflamatória. A presença persistente desses mediadores inflamatórios induz mudanças estruturais nos pulmões, como a hipertrofia das glândulas mucosas e a hiperplasia das células caliciformes e amplificação da resposta inflamatória através da ativação de células do sistema imune inato e adaptativo. Isso contribui para a hipersecreção de muco e disfunção ciliar, resultando em bronquite crônica, exacerbando ainda mais a obstrução das vias aéreas. Além disso, a inflamação crônica causa fibrose e estreitamento das pequenas vias aéreas, contribuindo para a destruição do parênquima pulmonar (enfisema) e remodelação das vias aéreas, levando à obstrução crônica do fluxo aéreo. A destruição dos alvéolos resulta na perda de elasticidade pulmonar e na dificuldade em manter as vias aéreas abertas durante a expiração, um dos principais desencadeadores da limitação do fluxo aéreo observada na DPOC (6-9).

O desequilíbrio enzimático é um componente crucial na patogênese da DPOC. Em um pulmão saudável, existe um equilíbrio entre proteases, que degradam proteínas, e antiproteases, que regulam a atividade das proteases. Na DPOC, este equilíbrio é alterado. As células inflamatórias, como neutrófilos e macrófagos, liberam grandes quantidades de proteases, especialmente a elastase neutrofílica, que degradam a elastina e outros componentes da matriz extracelular nos alvéolos. Em condições normais, as antiproteases, como a alfa-1-antitripsina (A1AT), inibem a atividade das proteases, protegendo o tecido pulmonar da destruição. Contudo, na DPOC, a atividade das proteases supera a capacidade das antiproteases, resultando na destruição do parênquima pulmonar e no desenvolvimento do enfisema. Além disso, a deficiência genética de A1AT é um fator de risco importante para o desenvolvimento precoce de DPOC, conforme descrito anteriormente, pois reduz ainda mais a capacidade de inibição das proteases (6-9).

O estresse oxidativo também desempenha um papel fundamental na fisiopatologia da DPOC. A inalação de fumaça do cigarro e outros irritantes ambientais aumenta a produção de espécies reativas de oxigênio (ERO) nos pulmões. As ERO são moléculas altamente reativas que podem danificar proteínas, lipídios e DNA nas células pulmonares. O estresse oxidativo não apenas danifica diretamente os tecidos pulmonares, mas também amplifica a inflamação ao ativar vias de sinalização inflamatórias e ao inativar antiproteases como a A1AT, exacerbando o desequilíbrio enzimático. A presença contínua de ERO promove a apoptose e necrose das células pulmonares, contribuindo para a destruição do parênquima e a progressão da DPOC (6-9).

Esses mecanismos fisiopatológicos resultam em alterações estruturais e funcionais dos pulmões. A destruição dos alvéolos reduz a área disponível para a troca gasosa, levando à hipoxemia e hipercapnia. A remodelação das vias aéreas, com fibrose e estreitamento, contribui para a obstrução crônica do fluxo aéreo e o aprisionamento de ar, resultando em hiperinsuflação pulmonar. Esses processos levam à diminuição da capacidade ventilatória e ao aumento da resistência ao fluxo aéreo, manifestando-se clinicamente como dispneia, tosse crônica e produção de escarro. Além disso, a inflamação sistêmica associada à DPOC pode causar manifestações extrapulmonares, como perda muscular, caquexia, doenças cardiovasculares, diabetes, osteoporose e aumento do risco de câncer de pulmão (6-9).

Os principais sintomas da DPOC incluem dispneia, tosse crônica e produção de escarro. A dispneia, ou falta de ar, é frequentemente o sintoma mais debilitante e ocorre inicialmente durante atividades físicas, progressivamente avançando para uma sensação constante de dificuldade respiratória mesmo em repouso. A tosse crônica, presente durante a maior parte dos dias por pelo menos três meses em dois anos consecutivos, é muitas vezes produtiva, resultando na expectoração de muco espesso e, em alguns casos, de cor amarelada ou esverdeada, indicando infecção. Além disso, os pacientes podem experimentar sibilos, que são sons respiratórios agudos causados pelo estreitamento das vias aéreas, e uma sensação de aperto no peito. A sintomatologia da DPOC influencia diretamente a vida dos pacientes, limitando suas atividades diárias e capacidade de exercício, levando ao isolamento social e ao desenvolvimento de ansiedade e depressão. A progressão da doença pode resultar em exacerbações frequentes, que são episódios agudos de piora dos sintomas, muitas vezes necessitando de hospitalização e podendo ser fatais. Essas exacerbações exercem impacto negativo na qualidade de vida, criando um ciclo de declínio funcional e saúde mental debilitada. O manejo dos sintomas através de terapias adequadas é crucial para melhorar a capacidade funcional e a qualidade de vida dos pacientes com DPOC (10-12).

1.2. Diagnóstico e severidade da DPOC

O diagnóstico da DPOC baseia-se em uma avaliação clínica abrangente, combinada com testes espirométricos para confirmar a presença de limitação persistente do fluxo de ar. A espirometria é o método padrão ouro para essa confirmação, medindo de forma precisa os volumes e fluxos pulmonares. Durante o teste, o paciente é instruído a realizar uma expiração forçada após a inalação completa, permitindo a obtenção de dois parâmetros críticos: o Volume Expiratório Forçado no primeiro segundo (VEF_1) e a Capacidade Vital Forçada (CVF) (1).

Para o diagnóstico da DPOC, os resultados da espirometria são avaliados antes e após a administração de um broncodilatador A relação entre o VEF_1 e a CVF (VEF_1/CVF) é calculada, e um valor pós-broncodilatador inferior a 0,7 é indicativo de limitação do fluxo aéreo não completamente reversível, característico da DPOC. Este critério é essencial para diferenciar a DPOC de outras condições respiratórias que podem apresentar sintomas semelhantes, como asma, na qual a obstrução do fluxo aéreo pode ser totalmente reversível com o uso de broncodilatadores. Além disso, a avaliação clínica envolve a análise detalhada dos sintomas respiratórios do paciente, bem como a consideração de fatores de risco. A combinação desses dados clínicos com os resultados da espirometria permite um diagnóstico mais preciso e a implementação de um plano de tratamento adequado para cada paciente (1). Após o diagnóstico, através da classificação proposta pelo GOLD é possível avaliar o grau de obstrução da via aérea através do VEF1 (**Tabela 1**) e o impacto dos sintomas de acordo com a Escala Modificada de Dispneia do Medical Research Council (mMRC) e o risco de exacerbação de acordo com o CAT: COPD Assessment Test. O mMRC é uma ferramenta utilizada para avaliar a gravidade da falta de ar em pacientes com doenças respiratórias, classificando a dispneia em uma escala de 0 a 4, com base na limitação das atividades diárias (13), já o CAT é um questionário padronizado composto por 8 perguntas, com a finalidade de avaliar o impacto da DPOC na saúde geral do paciente e na sua qualidade de vida, auxiliando no monitoramento da progressão da doença e na orientação do tratamento (14). O impacto dos sintomas pode ser avaliado conforme descrito na **Tabela 2** (1).

Tabela 1. Classificação da severidade da limitação do fluxo aéreo em pacientes com DPOC com VEF1/CVF <0,7.

GOLD 1	LEVE	VEF1 ≥ 80% do predito
GOLD 2	MODERADO	50% ≤ VEF1 < 80% do predito
GOLD 3	SEVERO	30% ≤ VEF1 < 50% do predito
GOLD 4	MUITO SEVERO	VEF1 < 30% do predito

Fonte: Adaptado de *Global Initiative for Chronic Obstructive Lung Disease*, 2024.

Abreviaturas: VEF_1: volume expiratório forçado no primeiro segundo.

<table>
<tr><td colspan="3">Tabela 2. Classificação da DPOC quanto ao impacto dos sintomas e o risco de exacerbação</td></tr>
<tr><td>História de exacerbação (anual)</td><td colspan="2"></td></tr>
<tr><td>≥ 2 exacerbações moderadas ou ≥ 1 levando à internação hospitalar</td><td colspan="2">E</td></tr>
<tr><td>0 ou 1 exacerbações moderadas (não levando à internação hospitalar)</td><td>A</td><td>B</td></tr>
<tr><td></td><td>mMRC 0 – 1
CAT < 10</td><td>mMRC ≥ 2
CAT ≥ 10</td></tr>
<tr><td></td><td colspan="2">Sintomas</td></tr>
</table>

Fonte: Adaptado de *Global Initiative for Chronic Obstructive Lung Disease*, 2024

Abreviaturas: mMRC: *modified Medical Research Council*; CAT: *COPD Assessment Test*.

O diagnóstico precoce e preciso da DPOC pode ter um impacto significativo na gestão e prognóstico da doença. A utilização de medições espirométricas pós-broncodilatador é fundamental para confirmar a limitação do fluxo aéreo. Indivíduos com uma relação VEF_1/CVF pré-broncodilatador inferior a 0,7, que aumenta para 0,7 ou mais após a broncodilatação, têm um risco aumentado de desenvolver DPOC no futuro. Os métodos complementares de diagnóstico da DPOC, como os exames de imagem, desempenham um papel crucial na confirmação do diagnóstico e na avaliação da extensão da doença. Tomografias computadorizadas (TC) de alta resolução são especialmente úteis, pois permitem a visualização detalhada do parênquima pulmonar e das vias aéreas, ajudando a identificar enfisema, bronquiectasias e outras alterações estruturais associadas à DPOC. Radiografias de tórax, embora menos sensíveis que a TC, podem revelar sinais de hiperinsuflação pulmonar e outras alterações sugestivas da doença. Esses exames complementam a espirometria, o teste padrão-ouro para o diagnóstico da DPOC, proporcionando uma avaliação mais abrangente da condição do paciente (1).

No entanto, o diagnóstico da DPOC enfrenta desafios significativos. Muitos pacientes, especialmente nos estágios iniciais da doença, podem ser assintomáticos ou apresentar sintomas leves que são frequentemente atribuídos a outras condições, como envelhecimento ou doenças cardíacas. Isso leva a um subdiagnóstico, e, consequentemente, a não introdução de tratamento. O impacto do subdiagnóstico é substancial, pois o tratamento tardio da DPOC resulta em uma progressão mais rápida da doença, piora dos sintomas e aumento das complicações associadas. Além disso, a falta de diagnóstico precoce impede a implementação de medidas preventivas e terapêuticas que poderiam retardar a progressão da doença e melhorar a qualidade de vida dos pacientes. Estudos indicam que o subdiagnóstico é comum, especialmente em populações de alto risco, como fumantes e idosos, ressaltando a necessidade de maior vigilância e uso de métodos diagnósticos complementares para identificar precocemente a DPOC e iniciar um tratamento adequado (9,15).

1.3. Epidemiologia, impacto econômico e social

Considerada uma preocupação global e de saúde pública, a DPOC afeta aproximadamente 384 milhões de pessoas mundialmente, sendo a terceira principal causa de morte, responsável por mais de 3 milhões de óbitos anuais. A prevalência e mortalidade associadas à DPOC variam substancialmente entre diferentes regiões e países, refletindo fatores como taxas de tabagismo, níveis de poluição ambiental e condições socioeconômicas. A prevalência global da DPOC é estimada em cerca de 11,7% na população adulta, variando entre 8,6% e 13,7% dependendo da região (16-18). Nos últimos anos, a prevalência de DPOC tem aumentado, especialmente em países em desenvolvimento como a China e a Índia, devido ao aumento das taxas de tabagismo e à exposição contínua a poluentes ambientais. Este crescimento na prevalência também está diretamente associado ao envelhecimento da população global e à rápida urbanização. Além disso, a falta de conscientização e de programas de prevenção eficazes em muitas regiões contribui para a crescente carga da doença (19,20).

No Brasil, a DPOC representa uma das principais causas de morbidade e mortalidade entre as doenças respiratórias, refletindo um grave problema de saúde pública. Dados do Ministério da Saúde revelam que a prevalência da DPOC em adultos com mais de 40 anos é de aproximadamente 12%, o que destaca a magnitude dessa enfermidade no país. Historicamente, a doença tem sido mais comum em homens, uma vez que as taxas de tabagismo são significativamente mais elevadas entre eles. No entanto, observa-se uma mudança preocupante nas tendências de prevalência, com um aumento significativo entre as mulheres. Esse aumento é atribuído ao crescimento do tabagismo feminino nas últimas décadas, que agora se reflete em maiores taxas de DPOC neste grupo (9,21).

Além da alta prevalência, a DPOC é responsável por uma elevada taxa de internações hospitalares e mortalidade no Brasil. A taxa de mortalidade ajustada por idade é de aproximadamente 20 por 100.000 habitantes, indicando a severidade e o impacto fatal da doença. Esse cenário é agravado nas áreas urbanas, onde a prevalência e a mortalidade são significativamente maiores. Fatores como a poluição do ar, resultante do tráfego intenso e das atividades industriais, além da exposição a outros agentes ambientais nocivos, contribuem para a maior incidência e severidade da DPOC nas cidades. Adicionalmente, a DPOC impõe um pesado fardo econômico e social. Os custos associados ao tratamento e às hospitalizações, bem como a perda de produtividade devido à incapacidade física, afetam não apenas os pacientes, mas também o sistema de saúde e a economia do país. A doença também tem um impacto profundo na qualidade de vida dos pacientes, limitando suas atividades diárias e provocando isolamento social e depressão (22-25). A DPOC impõe uma carga econômica substancial sobre os sistemas de saúde em todo o mundo. Os custos diretos incluem despesas com hospitalizações, consultas médicas, medicamentos e cuidados de longo prazo. Os custos indiretos resultam da perda de produtividade, aposentadorias precoces e morte prematura. No Brasil, estima-se que os custos diretos e indiretos associados à DPOC chegam a aproximadamente R$13 bilhões anualmente (26). A doença também tem um impacto significativo na qualidade de vida dos pacientes, causando limitações físicas, psicológicas e sociais que afetam não apenas os indivíduos, mas também suas famílias e comunidades (21). Os impactos sociais da DPOC são amplos e profundos. A doença pode levar a uma significativa limitação das atividades diárias, isolamento social e perda de produtividade. Pacientes com DPOC muitas vezes enfrentam dificuldades em realizar tarefas simples, como caminhar, subir escadas ou mesmo cuidar de si mesmos. Essas limitações físicas podem levar ao isolamento social, já que os pacientes evitam atividades que possam desencadear sintomas de dispneia severa. Além disso, a DPOC tem um impacto substancial na saúde mental dos pacientes. A ansiedade e a depressão são comuns entre pessoas com DPOC devido à constante luta contra os sintomas respiratórios e ao medo de exacerbações. A qualidade de vida é severamente comprometida, e muitos pacientes relatam uma sensação de perda de controle sobre suas vidas (27,28).

1.4. Impacto dos sintomas da DPOC na qualidade de vida e métodos de avaliação

A avaliação dos sintomas e do impacto na vida diária dos pacientes com DPOC é crucial para um manejo eficaz da doença. Duas ferramentas amplamente utilizadas para essa avaliação são a Escala Modificada de Dispneia do Medical Research Council (mMRC) e o Questionário de Qualidade de Vida do Hospital Saint George (SGRQ) (1). A gravidade da dispneia pode ser avaliada utilizando o mMRC, uma ferramenta simples, prática e amplamente utilizada na prática clínica. A mMRC é composta por uma escala de 0 a 4, na qual cada ponto representa um nível crescente de severidade da dispneia. O escore 0 indica dispneia apenas com atividade física extenuante, sugerindo que a pessoa não experimenta falta de ar durante as atividades cotidianas. O escore 1 corresponde a dispneia ao apressar-se em uma superfície plana ou ao caminhar em uma subida leve. O escore 2 é atribuído a indivíduos que andam mais devagar que outras pessoas da mesma idade em superfícies planas devido à falta de ar, ou que precisam parar para respirar ao caminhar no próprio ritmo. O escore 3 descreve pacientes que precisam parar para respirar após caminhar aproximadamente 100 metros ou após poucos minutos em superfícies planas. Finalmente, o escore 4 caracteriza dispneia extrema, sendo o indivíduo incapaz de sair de casa ou sentir falta de ar ao realizar tarefas mínimas, como vestir-se (29). A aplicação da mMRC é direta e rápida, tornando-a uma ferramenta útil para avaliar a limitação funcional relacionada à dispneia. O profissional de saúde solicita ao paciente que descreva suas experiências de falta de ar em diferentes situações cotidianas, atribuindo um escore de acordo com as respostas. Essa avaliação ajuda a entender melhor o impacto da dispneia na vida diária do paciente e a ajustar o tratamento de acordo com a necessidade individual. Além disso, a mMRC pode ser usada para monitorar a progressão da doença ao longo do tempo e avaliar a eficácia das intervenções terapêuticas. Estudos têm demonstrado que a mMRC é correlacionada com outras medidas de função pulmonar e qualidade de vida (13).

Além dos sintomas físicos, a DPOC tem um impacto significativo na vida social e emocional dos pacientes. O SGRQ é uma ferramenta validada amplamente utilizada para avaliar esses impactos. É composto por 50 itens que estão organizados em três domínios principais: sintomas, atividades e impactos. O domínio de sintomas aborda a frequência, a severidade e a natureza dos sintomas respiratórios que o paciente experimenta. As questões relacionadas às atividades avaliam em que medida a DPOC limita a capacidade do paciente de realizar tarefas diárias e atividades físicas. O domínio de impacto considera os efeitos psicológicos e sociais da doença, incluindo o impacto sobre o bem-estar emocional e a vida social do paciente (30). Para aplicar o SGRQ, o paciente responde a uma série de perguntas sobre a frequência e intensidade de seus sintomas, como tosse, produção de escarro, falta de ar e sibilos. As perguntas também incluem a limitação em atividades como caminhar, subir escadas, ou realizar tarefas domésticas, bem como questões sobre sentimentos de ansiedade, depressão, e isolamento social. Cada resposta é pontuada, e as pontuações são combinadas para fornecer escores em cada um dos três domínios, além de um escore total (31). O escore total do SGRQ varia de 0 a 100, onde escores mais altos indicam uma pior qualidade de vida relacionada à saúde. Essa medida compreensiva permite aos profissionais de saúde avaliar o impacto global da DPOC na vida do paciente. Estudos mostram que escores mais altos no SGRQ estão associados a pior prognóstico e maior utilização de serviços de saúde. Jones, P. W. e colaboradores conduziram um estudo que mostrou que escores mais altos no SGRQ estão correlacionados com um aumento nas hospitalizações e visitas ao pronto-socorro. O estudo destacou que pacientes com escores mais elevados no SGRQ têm uma pior qualidade de vida e maior frequência de exacerbações que requerem atendimento médico (32). Outro estudo constatou uma associação significativa entre escores elevados no SGRQ e a necessidade de cuidados intensivos, incluindo internações hospitalares frequentes e visitas ao pronto-socorro. O estudo sugeriu que o monitoramento dos escores do SGRQ pode ajudar a prever e prevenir exacerbações graves da DPOC (12). Isso torna o SGRQ uma ferramenta essencial para monitorar a progressão da doença, avaliar a eficácia das intervenções terapêuticas e ajustar o plano de tratamento de acordo com as necessidades individuais dos pacientes (32).

Sabe-se da importância do diagnóstico preciso e da avaliação dos sintomas da DPOC, a qual não pode ser subestimada, pois são essenciais para direcionar tratamentos adequados e monitorar a evolução da condição. A análise do impacto da DPOC na qualidade de vida e na funcionalidade dos pacientes é igualmente crucial para ajustar as intervenções e melhorar o bem-estar geral. No entanto, além desses fatores, a alimentação adequada se revela um componente vital no manejo da doença. Estudos demonstram que uma dieta balanceada pode não apenas influenciar no desenvolvimento da doença como pode melhorar o estado nutricional, controlar sintomas respiratórios e otimizar a qualidade de vida e o prognóstico dos pacientes com DPOC (33,34). Assim, é fundamental considerar a inclusão de uma estratégia alimentar eficaz como parte integrante da prevenção e tratamento da DPOC.

2. Associação entre consumo alimentar e DPOC

2.1. Nutrientes, alimentos e padrões alimentares associados ao risco de DPOC

A relação entre a ingestão alimentar e a saúde é uma área bem estabelecida e amplamente estudada na ciência da nutrição. Dietas ricas em nutrientes, abundantes em frutas, vegetais, grãos integrais, proteínas magras e gorduras saudáveis, estão consistentemente associadas a riscos reduzidos de doenças crônicas, como doenças cardiovasculares, diabetes e certos tipos de câncer (35,36). Por outro lado, dietas ricas em alimentos processados, açúcares adicionados e gorduras não saudáveis contribuem significativamente para a carga global de obesidade, síndrome metabólica e condições inflamatórias (37).

A DPOC é marcada por uma inflamação crônica que se agrava pelo estresse oxidativo, resultado do excesso de radicais livres que danificam células e tecidos pulmonares. Essa condição sugere que a inflamação e o estresse oxidativo são fatores-chave no desenvolvimento e progressão da doença. Considerando que nutrientes específicos, como ácidos graxos ômega-3, antioxidantes e fibras alimentares, são conhecidos por sua capacidade de reduzir a inflamação, minimizar o estresse oxidativo e melhorar a função imunológica, especula-se que uma dieta rica nesses componentes possa ter um impacto significativo na proteção das células pulmonares. Esses nutrientes podem neutralizar os radicais livres e reduzir a inflamação, ajudando a prevenir ou retardar o desenvolvimento da DPOC. Portanto, uma alimentação adequada pode desempenhar um papel crucial na prevenção e no manejo da doença (38,39).

Os antioxidantes desempenham um papel fundamental na modulação da resposta inflamatória e na mitigação do estresse oxidativo, processos intimamente ligados à saúde celular e ao desenvolvimento de diversas doenças crônicas (38). A inflamação é uma resposta do sistema imunológico a lesões e infecções, que envolve a liberação de moléculas pró-inflamatórias, como citocinas e quimiocinas, e a ativação de células imunes. No entanto, a inflamação crônica pode causar danos celulares e teciduais. O estresse oxidativo, por sua vez, é caracterizado pelo desequilíbrio entre a produção de espécies reativas de oxigênio (ROS) e a capacidade do organismo de neutralizá-las. ROS, como os radicais livres, são subprodutos normais do metabolismo celular, mas em excesso, podem causar danos ao DNA, proteínas e lipídios celulares (39,40). Os antioxidantes agem neutralizando ROS, prevenindo assim os danos celulares e o desencadeamento de respostas inflamatórias. Vitaminas como a C (ácido ascórbico) e E (alfa-tocoferol) são antioxidantes potentes que doam elétrons aos radicais livres, convertendo-os em moléculas menos reativas e prevenindo a peroxidação lipídica e a oxidação de proteínas e DNA. A vitamina C, além de neutralizar ROS, regenera a forma ativa da vitamina E, criando um ciclo sinérgico de defesa antioxidante (40).

Os polifenois, compostos bioativos encontrados em frutas, vegetais, chá e vinho tinto, possuem propriedades antioxidantes e anti-inflamatórias significativas. Eles atuam modulando várias vias de sinalização celular, incluindo a inibição de enzimas pró-inflamatórias como a ciclooxigenase (COX) e a lipoxigenase (LOX), e a supressão da ativação do fator nuclear kappa B (NF-κB), um regulador chave da resposta inflamatória. Além disso, os polifenóis aumentam a expressão de enzimas antioxidantes endógenas, como a superóxido dismutase (SOD), a catalase e a glutationa peroxidase, através da ativação do fator nuclear eritroide 2 relacionado ao fator 2 (Nrf2), uma via crucial para a resposta antioxidante (41,42).

Já as fibras alimentares, consumidas principalmente através de frutas, vegetais, grãos integrais e leguminosas, não são apenas essenciais para a manutenção da saúde digestiva, mas também exercem efeitos anti-inflamatórios. Elas contribuem para a produção de ácidos graxos de cadeia curta (AGCC) pela fermentação bacteriana no intestino, os quais desempenham um papel crucial na redução da inflamação sistêmica (43). Os AGCC, como o butirato, são capazes de inibir a produção de citocinas pró-inflamatórias e melhorar a integridade da barreira intestinal, prevenindo a translocação de endotoxinas para a circulação sistêmica (44). Além disso, as fibras alimentares modulam a composição da microbiota intestinal, promovendo o crescimento de bactérias benéficas que estão associadas a um perfil inflamatório reduzido (45). Estudos epidemiológicos e clínicos têm consistentemente demonstrado que dietas ricas em fibras estão associadas a menores níveis de marcadores inflamatórios, como a proteína C-reativa, corroborando a importância das fibras na prevenção e manejo de doenças inflamatórias crônicas (46,47).

Diversos nutrientes, alimentos específicos e padrões dietéticos têm sido estudados por sua associação com o risco de desenvolver DPOC. Alguns micronutrientes frequentemente estudados são a vitamina D, polifenóis e os ácidos-graxos ômega-3. A vitamina D possui propriedades anti-inflamatórias e imunomoduladoras. Estudos demonstram que níveis adequados de vitamina D estão associados à melhor função pulmonar e à redução das exacerbações da DPOC. Em um estudo prospectivo, níveis mais altos de vitamina D foram associados a menor incidência de DPOC (48). A deficiência de vitamina D pode exacerbar a inflamação pulmonar e aumentar o risco de infecções respiratórias, contribuindo para a progressão da DPOC. Já os polifenóis, são compostos encontrados em frutas, vegetais, chá, vinho e outras plantas, conhecidos por suas propriedades antioxidantes. Eles podem proteger os pulmões contra danos oxidativos e inflamatórios, comuns na DPOC. Um estudo evidenciou que uma dieta rica em polifenóis estava associada a uma menor incidência de DPOC. Esses compostos podem ajudar a reduzir o estresse oxidativo e a inflamação nas vias aéreas, fatores críticos na patogênese da DPOC (49). Em relação aos ácidos graxos ômega-3, um estudo de coorte publicado no "American Journal of Respiratory and Critical Care Medicine" relatou que a maior ingestão de ácidos graxos ômega-3 estava associada a uma menor incidência de DPOC. Esses ácidos graxos podem modular a resposta inflamatória crônica e melhorar a saúde das vias aéreas (50).

Alimentos isolados ou agrupados também têm sido vastamente explorados. Dentre eles, o consumo de frutas e vegetais é associado a um menor risco de DPOC. Frutas e vegetais são ricos em antioxidantes, fibras e vitaminas que podem proteger os pulmões contra danos oxidativos e inflamatórios (51). O chá verde, por sua vez, é rico em catequinas, um tipo de polifenol com propriedades antioxidantes. Em um estudo prospectivo, o consumo de chá verde foi associado a uma menor prevalência de DPOC em uma população asiática (52).

Já a análise de padrões dietéticos tem emergido como uma abordagem superior em relação à análise de nutrientes ou alimentos isolados quando se trata de investigar a associação com o desenvolvimento de doenças crônicas, incluindo a DPOC. Essa superioridade se deve a vários fatores interrelacionados que incluem a complexidade das interações alimentares, a variabilidade individual na resposta a nutrientes e a necessidade de uma visão holística da alimentação humana. Um dos principais argumentos a favor da análise de padrões dietéticos é a consideração das interações complexas entre diferentes nutrientes presentes na dieta. Os alimentos não são consumidos de forma isolada, mas como parte de refeições que contêm uma variedade de nutrientes que podem interagir entre si de maneiras sinérgicas ou antagônicas. A análise de nutrientes isolados falha em capturar essas interações, potencialmente subestimando ou superestimando os efeitos de certos nutrientes sobre a saúde. Estudos recentes demonstram a associação entre o risco de DPOC e a aderência a padrões dietéticos como a Dieta *Plant Centered*, Dieta Prudente, *Alternative Healthy Eating Index* (AHEI-2010), Dieta *Plant-Based* versão saudável, *Dutch Dietary Guidelines-2015*, Dieta balanceada, Índice inflamatório da dieta, Dieta *Plant-Based* versão não saudável e Dieta Ocidental.

A dieta centrada em plantas, ou *Plant Centered Diet*, é caracterizada por um alto consumo de frutas, vegetais, grãos integrais, legumes, nozes e sementes, com uma ênfase reduzida em alimentos de origem animal e produtos processados. Jackson et al. (2023) demonstraram que a adesão a uma dieta centrada em plantas está inversamente associada ao enfisema radiográfico, sugerindo uma proteção potencial contra a DPOC (53). Este padrão dietético é rico em antioxidantes, fibras e fitoquímicos, que possuem propriedades anti-inflamatórias e antioxidantes essenciais para a manutenção da saúde pulmonar. A dieta prudente, conhecida como *Prudent Diet*, inclui um alto consumo de frutas, vegetais, peixe, aves, grãos integrais e laticínios com baixo teor de gordura, e uma baixa ingestão de carnes vermelhas e processadas, gorduras saturadas e açúcares refinados. Varraso et al. (2007) demonstraram que a adesão à dieta prudente está associada a um menor risco de DPOC entre homens nos Estados Unidos. Este padrão dietético promove um equilíbrio nutricional, favorecendo a ingestão de nutrientes anti-inflamatórios e antioxidantes (54).

O *Alternative Healthy Eating Index* (AHEI-2010) avalia a qualidade da dieta com base na ingestão de alimentos e nutrientes específicos, incluindo frutas, vegetais, nozes, leguminosas, ácidos graxos poli-insaturados, e um baixo consumo de açúcar, sódio e carnes vermelhas. Varraso et al. (2015) demonstraram que uma pontuação alta no AHEI-2010 está associada a um menor risco de DPOC em homens e mulheres nos Estados Unidos. Este índice reflete um padrão dietético que promove a saúde geral e a função pulmonar através de uma ingestão equilibrada de nutrientes (55). O AHEI é uma variação dos HEI, ferramentas utilizadas para avaliar a qualidade da dieta com base em recomendações alimentares. O HEI-2005 foi o primeiro a ser desenvolvido, considerando 9 componentes alimentares, com pontuações atribuídas conforme a adequação do consumo de alimentos a diretrizes dietéticas (56). O HEI-2010 ampliou o número de componentes para 12, incorporando novas recomendações nutricionais, como a redução de sódio e a inclusão de alimentos integrais (57). Em 2015, o HEI foi novamente ajustado, com a atualização de critérios e inclusão de novas diretrizes, refletindo as mudanças nas recomendações alimentares baseadas em evidências científicas (58). O HEI-2020, a versão mais recente, modificou alguns componentes e aprimorou a pontuação para refletir melhor as diretrizes alimentares atuais, incluindo critérios mais detalhados para as fontes de proteínas e a ingestão de grãos integrais (59).

O padrão dietético *Healthful Plant-Based Diet* enfatiza o consumo de alimentos vegetais saudáveis, como frutas, vegetais, grãos integrais, nozes e legumes, e minimiza o consumo de alimentos processados e de origem animal. Varraso et al. (2023) evidenciaram, que dietas baseadas em plantas saudáveis estão associadas a um menor risco de DPOC. Este padrão é particularmente benéfico devido ao seu alto conteúdo de fibras, antioxidantes e fitoquímicos, que desempenham um papel crucial na redução da inflamação pulmonar (60).

As diretrizes dietéticas holandesas de 2015, ou *Dutch Dietary Guidelines-2015*, recomendam uma dieta rica em frutas, vegetais, nozes, grãos integrais, legumes, produtos lácteos com baixo teor de gordura e peixes, com uma redução no consumo de carnes vermelhas e processadas, açúcar e sal. Voortman et al. (2017) demonstraram que a adesão a essas diretrizes está associada a um menor risco de doenças não transmissíveis, incluindo a DPOC, na população estudada. Este padrão dietético promove uma ingestão balanceada de nutrientes que suportam a saúde pulmonar e reduzem a inflamação sistêmica (61). A dieta equilibrada, ou *Balanced Diet*, envolve a ingestão proporcional de macronutrientes (carboidratos, proteínas e gorduras) e micronutrientes (vitaminas e minerais), com um foco na variedade e moderação. Estudos sugerem que uma dieta equilibrada, rica em alimentos integrais e pobres em alimentos processados, está associada a uma redução no risco de DPOC. Este padrão dietético garante uma ingestão adequada de nutrientes essenciais para a manutenção da função pulmonar e a prevenção da inflamação crônica (62,63).

Por outro lado, o índice inflamatório da dieta, ou *Dietary Inflammatory Index (DII)*, mede o potencial inflamatório da dieta com base na ingestão de alimentos e nutrientes específicos que promovem ou reduzem a inflamação. Maisonneuve et al. (2016) identificaram que uma dieta com um alto DII está associada a um aumento do risco de condições respiratórias, incluindo a DPOC, entre fumantes pesados. Dietas com alto DII são geralmente ricas em alimentos processados, gorduras saturadas e açúcares refinados, que aumentam os níveis de marcadores inflamatórios no corpo (64). O padrão dietético *Unhealthful Plant-Based Diet* é caracterizado pelo consumo de alimentos vegetais não saudáveis, grãos refinados, bebidas açucaradas, batatas fritas e sobremesas açucaradas, com uma baixa ingestão de alimentos vegetais saudáveis. Varraso et al. (2023) evidenciaram que uma dieta baseada em plantas não saudáveis está associada a um maior risco de DPOC. Apesar de ser baseada em plantas, este padrão dietético inclui alimentos que promovem inflamação e estresse oxidativo, contribuindo para a deterioração da função pulmonar (60).

A dieta ocidentalizada, ou *Westernized Diet*, é caracterizada por um alto consumo de alimentos processados, carnes vermelhas e processadas, açúcares adicionados, gorduras saturadas e alimentos ricos em sódio, com uma baixa ingestão de frutas, vegetais e grãos integrais. Varraso et al. (2007) e outros estudos têm demonstrado que a adesão a este padrão dietético está associada a um aumento significativo no risco de DPOC. Este padrão dietético é pró-inflamatório, exacerbando a inflamação pulmonar e o estresse oxidativo, fatores-chave na patogênese da DPOC (54).

2.2. Nutrientes, alimentos e padrões alimentares associados a desfechos clínicos em pacientes com DPOC

Considerando possíveis benefícios em pacientes com DPOC, vários nutrientes e alimentos têm sido explorados, com ênfase na redução da inflamação e no estresse oxidativo. Ácidos graxos ômega-3, encontrados em peixes gordurosos como salmão e atum, têm demonstrado potencial para reduzir a inflamação e melhorar a função pulmonar, com estudos demonstrando que essas substâncias podem diminuir os marcadores inflamatórios e melhorar a qualidade de vida dos pacientes (38). Antioxidantes, como a vitamina C, presente em frutas cítricas e pimentões, e a vitamina E, encontrada em nozes e óleos vegetais, têm sido associados à redução do estresse oxidativo, com evidências sugerindo que esses nutrientes podem diminuir a gravidade dos sintomas e proteger as células pulmonares dos danos oxidativos (65,66). O selênio, um mineral encontrado em castanhas do Brasil e frutos do mar, também pode reduzir o estresse oxidativo e melhorar a função respiratória, conforme relatado em estudos que associam sua ingestão à melhora da função pulmonar (67). Carotenoides, como o beta-caroteno presente em cenouras e espinafre, têm propriedades antioxidantes que podem beneficiar a saúde pulmonar, com estudos apontando que a ingestão desses compostos pode estar relacionada a uma menor progressão da doença e uma melhor função pulmonar (68). Além disso, fibras alimentares, encontradas em grãos integrais, frutas e vegetais, têm sido associadas a efeitos anti-inflamatórios e a uma microbiota intestinal saudável, com pesquisas sugerindo que a alta ingestão de fibras pode melhorar a função pulmonar e reduzir a inflamação sistêmica (69). Por fim, a curcumina, um composto ativo da cúrcuma, tem apresentado potencial anti-inflamatório e antioxidante, com estudos indicando que pode reduzir marcadores inflamatórios e melhorar os sintomas da DPOC (70). Esses estudos demonstram que a inclusão desses alimentos e nutrientes na dieta pode ter um impacto positivo nos desfechos clínicos de pacientes com DPOC, oferecendo uma abordagem complementar ao tratamento convencional.

Quando se trata da relação entre padrões dietéticos e desfechos clínicos em pacientes com DPOC, os estudos disponíveis são mais escassos. Uma revisão de literatura recente identificou apenas quatro estudos que abordam essa associação. Os padrões dietéticos investigados nesses estudos incluem a adesão ao *Mediterranean Diet Adherence Screener* (MEDAS) (71), ao *Healthy Eating Index* (HEI) de 2005 e 2010 (72,73), à dieta saudável e dieta mista (74). Os achados desses estudos variam, mas indicam potenciais associações entre padrões alimentares saudáveis e melhores desfechos clínicos em pacientes com DPOC.

Um estudo demonstrou que pacientes com menor adesão ao MEDAS apresentavam escores mais altos de fadiga, enquanto aqueles com maior adesão ao MEDAS exibiam melhores escores na escala de Atividades da Vida Diária (ADL) (71). Outro estudo, utilizando o Inventário de Depressão de Beck, encontrou uma associação inversa entre uma dieta saudável e mista e o risco de depressão (74). Em uma mesma amostra, dois estudos avaliaram a relação entre os escores do HEI-2005, HEI-2010 e a dieta mediterrânea com diferentes desfechos: nenhum padrão dietético foi associado à gravidade da DPOC (73), porém todos os padrões apresentaram correlação inversa com os escores de qualidade do sono (72). Um estudo único avaliou a função pulmonar como desfecho e demonstrou uma associação significativa entre uma dieta mista, que consiste em um maior consumo de molhos, frutas secas, maionese, gorduras saturadas, grãos integras, carne vermelha e vegetais crucíferos, e um maior VEF_1 e a CVF, sem associações observadas com padrões dietéticos saudáveis ou não saudáveis (74).

JUSTIFICATIVA

A DPOC é uma condição respiratória crônica que afeta milhões de pessoas em todo o mundo, impactando significativamente na qualidade de vida, na função pulmonar e na capacidade funcional dos pacientes. Embora fatores como tabagismo e poluição do ar sejam amplamente reconhecidos como contribuintes primários para o desenvolvimento e a progressão da DPOC, há um crescente corpo de evidências sugerindo que a dieta pode desempenhar um papel crucial no desenvolvimento e na modulação da doença. No entanto, a relação entre padrões dietéticos e desfechos clínicos em pacientes com DPOC ainda é pouco compreendida e pouco explorada na literatura científica.

Neste contexto, revisar a literatura existente que avalia a associação entre padrões dietéticos e a DPOC, ou desfechos clínicos em pacientes com DPOC, possibilita um mapeamento da literatura sobre o tema para entendimento da evidência disponível e identificação das lacunas a serem investigadas em estudos futuros. Além disso, há uma necessidade de mais estudos que explorem a associação entre a adesão a padrões dietéticos saudáveis e desfechos clínicos em pacientes com DPOC, tais como prognóstico da doença, função pulmonar, qualidade de vida, capacidade funcional, exacerbações, entre outros. Portanto, investigar a associação entre a adesão a padrões dietéticos saudáveis e desfechos clínicos em pacientes com DPOC pode contribuir para o estabelecimento de orientações nutricionais específicas a essa população.

QUESTÃO DE PESQUISA

1. Quais os métodos de avaliação de consumo alimentar utilizados para avaliar risco, prevalência e desfechos em pacientes com DPOC? Quais os desfechos de interesse estudados na população com DPOC?
2. Existe associação entre a pontuação do *Healthy Eating Index-2020* (HEI-2020) e desfechos clínicos em pacientes ambulatoriais com DPOC?

HIPÓTESE DE PESQUISA

1. A literatura acerca da associação entre padrões dietéticos e presença de DPOC e desfechos clínicos em portadores da doença é escassa e lacunas nessa temática apontam para a necessidade de estudos investigando essa relação.
2. Pacientes com DPOC com pontuações mais altas no HEI-2015 apresentariam melhor qualidade de vida, melhora na função pulmonar, maior capacidade funcional e dispneia menos grave em comparação com aqueles com pontuações mais baixas no HEI-2010.

OBJETIVOS

Mapear a literatura para identificar padrões dietéticos como potenciais fatores protetores ou de risco para DPOC e sua associação com desfechos clínicos em portadores da doença e explorar a relação entre a qualidade da dieta de pacientes com DPOC em acompanhamento ambulatorial e severidade da doença e da dispneia, capacidade funcional, qualidade de vida e prognóstico.

Objetivos específicos

- Mapear a literatura para identificar padrões dietéticos como potenciais fatores protetores ou de risco para DPOC e sua associação com desfechos clínicos em portadores da doença.
- Avaliar a associação entre a qualidade da dieta de pacientes com DPOC em acompanhamento ambulatorial e severidade da doença e da dispneia, capacidade funcional, qualidade de vida e prognóstico.

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ARTIGO 1

Dietary patterns and risk of Chronic Obstructive Pulmonary Disease (COPD) and clinical outcomes in diagnosed patients: a scoping review.

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HIGHLIGHTS

- Literature on COPD and dietary patters is predominantly composed of studies evaluating the association between healthy and unhealthy dietary patterns and risk of COPD. In general, these studies have shown that healthy dietary patterns such as Mediterranean Diet and a higher adherence to Healthy Eating Index (HEI) have a protective role in COPD presence or incidence.

- There is scarce evidence on relationship between healthy and unhealthy dietary patterns and clinical outcomes in COPD patients, highlighting a large room for research in this area.

ABSTRACT

Background & Aims: Limited research exists on the association between dietary patterns (DP) and COPD risk or health-related outcomes. We reviewed existing literature to identify DP as a potential factor influencing COPD development and associated health outcomes in diagnosed individuals.

Methods: We followed the Joanna Briggs Institute methodology for this scoping review, conducting searches on PubMed, Scopus, Embase, and Web of Science to identify studies meeting our inclusion criteria (P, population - adults from the general population with or without COPD diagnosis; C, concept - DP; C, context - any setting). Two reviewers screened titles and abstracts, confirmed eligibility through full-text examination, extracted data using Redcap®, and assessed bias risk with the Newcastle Ottawa Scale.

Results: We analysed 24 studies with sample sizes ranging from 121 to 421,426 individuals aged 20 to 75. Eighty-three percent investigated COPD risk or odds ratios, while 16.7% examined health-related COPD outcomes. Food frequency questionnaires predominated (75%) in exploring 23 distinct DP. Sixty-seven percent employed a priori-defined DP, focusing on the Mediterranean Diet (MedDiet) and Healthy Eating Index (HEI), while 33.3% utilised a posteriori-defined DP, mainly represented by the Prudent and Traditional DP. Sixty percent of the studies reported significant associations between DP and COPD risk/odds. However, studies examining DP and COPD patient outcomes produced varied results.

Conclusions: Most studies focused on assessing COPD risk using a priori-defined DP, particularly emphasising the Med Diet and HEI. Overall, the studies found that healthy DPs are associated with reduced risk of COPD and improved outcomes in diagnosed patients.

Keywords: diet, dietary patterns, dietary intake, COPD, lung function.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) ranks among the ten major causes of years of life lost worldwide in the population aged 50 years and older, contributing to the rise in non-communicable diseases (1). Additionally, COPD stands as the third leading cause of mortality globally, accounting for more than three million deaths in 2019 (2). Global estimates indicate that about 12.2% of the population lives with the disease currently, with projections of its prevalence increasing due to population ageing (3).

COPD constitutes a heterogeneous lung condition characterised by chronic respiratory symptoms (dyspnoea, cough, and expectoration) due to persistent abnormalities of the airways (bronchitis and bronchiolitis), alveoli (emphysema), and/or pulmonary vessels, confirmed by airflow limitation by spirometry examination and/or objective evidence of structural or physiological lung dysfunction (4). Gene-environment interactions over an individual's lifetime determine COPD development by causing lung damage or altering normal lung processes (5). Prolonged inhalation exposure to smoking, irritant gases, or particulate matter in the occupational or home environments are the main contributors to the burden of COPD (6).

Over the past two decades, an expanding understanding of the environmental aetiology of COPD has revealed the potential impact of nutritional factors as additional determinants of the disease and its progression. Evidence has demonstrated that individual nutrients and food groups influence the risk of developing COPD in the general population (7). Adhering to a healthy dietary pattern (DP) is associated with a lower risk of COPD, while following an unhealthy pattern may increase the risk of the disease (8,9). In patients with the disease, the dietary components can impact the decline in pulmonary function (10) and respiratory symptoms (11).

Examining DP instead of focusing on individual nutrients or foods is widely recognized for considering their component synergy This approach offers a more precise understanding of their health effects and aids in developing practical and easily understandable nutritional messages for the target audiences (12,13). As far as we know, no scoping review has addressed the association between DP and COPD risk or clinical outcomes in COPD individuals. Therefore, this study aimed to map the literature to identify DP as a potential protective or risk factor for COPD and health-related outcomes in COPD individuals. Additionally, we aimed to pinpoint the knowledge gaps to guide future research.

METHODS

This scoping review adhered to the Joanna Briggs Institute (JBI) methodology (14). We registered the project on Open Science Framework (https://doi.org/10.17605/OSF.IO/HW2CB) and reported it according to Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (15). The review process involved the JBI framework five stages (14), as described below.

1.1. Stage 1: identifying the research question

The main research question considers population, concept, and context (PCC) as described in Table 1. Box 1 presents the primary questions and sub-questions of the scoping review.

1.2. Stage 2: identifying relevant studies

We included observational studies, regardless of the publication date, language, or context, investigating the association between DP and the risk of COPD in the general population or any health-related outcome in individuals with COPD. We excluded studies that evaluated the association between DP and other respiratory health outcomes in the general population, apart from the risk of COPD.

The search for relevant sources of information initially occurred in PubMed (via the National Library of Medicine). Then, we adapted this strategy to Embase (via Elsevier), Web of Science (via Clarivate Analytics®), and Scopus (via Elsevier). We conducted additional searches by checking the reference list of all studies from this review and utilising the "cited by" function in PubMed to find potential eligible studies. We searched all databases on May 9, 2023, and updated it on October 30, 2023. Supplementary Box 2 presents the full-search strategies applied in all databases.

1.3. Stage 3: selection of eligible studies

We utilised Rayyan® (16) and Endnote® (17) for data organisation and removed duplicates using Endnote® automated deduplication function. Afterward, one reviewer (FMS) manually removed duplicates from the Rayyan® library. Then, two independent reviewers (CI and PZ) assessed the eligibility of each study through a two-step process. Initially, they reviewed the titles and abstracts and selected all potentially eligible articles. Subsequently, they read the full text to confirm eligibility. A third reviewer (FMS) resolved any disagreements.

1.4. Stage 4: data extraction

Two independent reviewers (CI and PZ) extracted data from the included articles using a standardised data form developed in RedCap® (18). A third reviewer (SB) resolved any disagreements. Before commencing the extraction process, we conducted a pilot test with five randomly selected full texts to ensure consistency and reduce the risk of errors. The extracted data included the following:

1. Publication details included first author, publication year and language, journal (categorised as nutrition or pulmonology and general medicine). Also we checked if the publication is open access or not in the websites of the journal;

2. Study details included primary aim, design, number of research centres involved, setting(s), eligibility criteria, sample characteristics (including size calculation and total number of participants), follow-up time for cohort studies, and disclosure of conflict of interest and funding.

3. Participant characteristics encompassed demographics, health status, and country of origin.

4. Dietary patterns, which involved its denomination, methodologies used to obtain them and their main components, dietary assessment methods (including instruments utilised, administration mode, assessor, number of days assessed, evaluation frequency, and when applicable, its validation and type, number of food items and groups, and period to which subjects report the consumption).

5. Outcomes of interest included the main findings about the association between COPD risk and DP or clinical outcomes in participants with COPD.

6. Other information included details of data analysis.

7. Risk of bias: Due to the recent interest and wide approach possibilities, studies evolving COPD and DP are heterogeneous in methodological matters. The lack of standardisation enables gaps regarding the methodological quality and quality of the evidence. Therefore, we decided to apply the Newcastle-Ottawa Scale (NOS)(19) to assess the methodological quality of the included studies. Two reviewers (CI and PZ) independently applied the NOS (19), a star rating system that evaluates the risk of bias in case-control and cohort studies, along with its modified version for cross-sectional studies. The scale assesses various sections in cohort studies, including case selection (such as representativeness of the cohort, selection of non-exposed cohort, case definition, and outcome of interest), comparability (such as proper

comparison by controlling for age, gender, or other factors), and exposure (such as outcome assessment, long enough follow-up, and adequate follow-up). Before initiating the evaluation of the studies, we standardised some of NOS questions. The standardisations were setted as follows: A representative sample of the COPD individuals in the community included participants 40 years old and over selected by an validated sampling approach or if the study was multicentric; ascertainment of the exposure through validated food consumption assessment was considered as secure record; the most important confounder adjustments were age and smoking status; definition of the cases due to spirometry test was considered as independent blind assessment; a follow-up of at least 5 years was considered appropriated for the outcome incidence. In longitudinal cohort studies or case-control studies, a rating of 7 to 9 stars indicates high quality, 5 to 6 stars medium quality, and less than or equal to three stars low quality (20,21). In cross-sectional studies, we applied the same scoring categorization system proposed for the other studies, except for the high risk of bias category, where scores ranged from 0 to 4. A third researcher (SB) resolved any disagreements arising between the reviewers.

1.5. Stage 5: summarising and reporting the results

We summarised and reported the data using descriptive approaches in tables, figures, and narrative form, presenting categorical variables as absolute (n) and relative (%) frequency, and continuous variables as mean or median (minimum and maximum). We created tables and figures to describe the findings. We grouped the DP as healthy or unhealthy based on their components.

RESULTS

Studies characteristics

Figure 1 illustrates the flow chart of screening-eligible articles for this review. We identified 5,439 articles through databases and manual searches. After removing duplicates, 3,783 articles remained for title and abstract screening. We excluded 3,735 articles for not meeting the eligibility criteria. The remaining 48 articles underwent a full-text examination. After examination, we excluded 24 reports (Supplementary Table S1), resulting in 24 included studies (22–45).

The publications occurred from 2007 (39) to 2023 (2,8,9,20,22) (Table 2) in 19 distinct journals, predominantly those from Nutrition (n=12, 50%) (22,23,25,31-35,37,40,43,45) and Pulmonology areas (n=8, 33.3%) (24,26-28,30,36,38,39). All studies were in English, with the majority being open-access publications (24-26,27-31,32-34,36-40,42-45) (n=21, 88%). Conflict of interest disclosures were absent in three studies (23,27,38), while the majority revealed no conflicts (n=21, 72.4%). Among studies mentioning funding (22,24,25,27,29,31-33,36-42,44,45) (n=21, 88%), 76.2% (n=16) reported receiving funding (22,24-27,31-33,37-42,44,45), with only one funded by industry (37). In the current analysis, focusing exclusively on observational studies, the predominant design was cross-sectional (23-27,31,34-38,43,44) (n=13, 54.2%) (Table 2) and conducted in a single centre (4,6,7,9–12,16,17,19–24) (n=15, 62.5%).

Participant Characteristics

Studies included a minimum of 121 (35,44) and a maximum of 421,426 (45). Their ages ranged from 20 (25) to 75 (39) years, with a median age of 55.6. More than 50% of participants were males in 13 studies (Table 2), did not include sample size estimates calculation (n = 21, 88%) (2–5,7–10,12–24), and recruited participants from the community (n=14, 58.3%) (24,25,27,28,30,31,32,34,36-38,42,43,45). Out of the total studies analysed, 16 (66.7%) (24,25,27,30-32,34,36-43) involved general population [two included ever/ heavy smokers (30,32) whereas three involved health professionals (39-41)] , four (16.7%) (23,26,35,44) focused solely on individuals with COPD, while four (16.7%) (22,28,29,33) included individuals with and without COPD (Table 2).

Most participants were from USA (n=9, 37.5%) (24,25,27,30,31,39-41,43), followed by Iran (n=6, 25%) (22,26,29,33,35,44) (Supplementary Figure S1). Most participants in the studies were from large cohorts (n=17, 70.8%) (24,25,27,28,30-32,34,36-43,45) , including National Health and Nutrition Examination Survey (NHANES) (n=4, 16.7%) (25,27,31,43) and Health Professionals Follow-up Study (HPFS) (n=3, 12.5%) (39-41), with mean follow-up of 16 years (34,39,40,41,42,45), ranging from five (34) to 34 years(41) .

Primary Purpose of studies

We categorised the objectives of the included studies into two main categories: 1) risk/odds of COPD and 2) health-related outcomes in patients diagnosed with COPD. Twenty studies (83.3%) evaluated the risk/ odds of COPD, with 13 studies assessing prevalence (24,25,27-29,31-34,36-38,43) and seven assessing incidence (30,32,39-42,45) [two of which specifically involved pulmonary emphysema (30,32)]. Among studies involving only individuals with COPD (n = 4, 16.7%), the outcomes were fatigue and activities of daily living (ADL) (23), sleep quality (35), depression (26), and disease severity (44).

Most studies conducted multivariate analysis adjusted for confounders as illustrated in Supplementary Figure 2, except two studies that performed bivariate analysis or crude multivariate analysis (23,35). Fifteen studies (62.5%) adjusted the analysis for age, sex, energy intake, and educational level (22,24,27,29,30,32,33,36-42,45), and fourteen (58.3%) for body mass index (BMI) (24,26,27,29,30,31,34,37-39,41,42,44,45), while for 11 studies (45.8%) adjusted for pack-years (22,24,25,28,34,36,38-41,43) and five (20.8%) for smoking status (22,24,26,27,29).

Dietary intake assessment

The studies assessed dietary intake using food frequency questionnaire (FFQ) (n=18, 75%) (23-28,31-33,35-40,43-45), 24-hour dietary recall (24-h DR) (n=4, 16.7%) (30,34,41,42) (Figure 2 and 3), diet history (n=1, 4.2%) (8), and Mediterranean Diet Adherence Screener (MEDAS) (n=1, 4.2%) (22). The dietary assessments occurred between 1984 (41) and 2022 (23). Among the studies using FFQ, the majority applied a semi-quantitative version (n = 10) (22,24,26,28,29,32,33,37,38,42) with a mean of items equal to 160 related to a mean of 30 food groups. Most of the studies used self-administered FFQ (n = 7) and only four studies used repeated measures of FFQ. Regarding the studies using 24-h dietary recall, the application method was not described in three of four studies (25,27,31). Half of studies applied only one 24-h DR, while the other two applied it twice (25,31).

Dietary patterns

The studies investigated 23 DP, as illustrated in Figure 4. Sixteen studies (66.7%) adopted a priori-defined DP, while eight studies (33.3%) opted for a posteriori-defined DP. Twelve studies evaluated more than one DP. Supplementary Table S2 presents the details of each DP evaluated in the included studies. Nine different DP received classification as healthy.

A priori-defined DP: Among the sixteen studies (66.7%) that applied a priori-defined DP (22,27,29-32,34,36-39,41-45), 13 different (86.7%) DP were identified, including most frequently an approach based on the Dietary Guidelines for Americans (evaluated through the healthy eating indexes [HEI]) (n = 5, 20,8%) (27,29,35,40,44) and the Mediterranean diet (MedDiet) (n = 6, 46.2% of all) (22,31,38,41,43,45) (Supplementary Table S2). Other DP evaluated included Plant-based diet index (41), Low-carb diet (33), Dietary Inflammatory Index (DII) (25,31,32), and Dutch Dietary Guidelines (42).

Most studies investigated a single DP (n = 11, 68.8%), while the remaining evaluated two (n = 3, 18.8%) or three (n = 2, 12.5%) DP. Sixty-eight percent of them included up to 12 dietary components (22,27-29,35,40,43,44), while the remaining included between 14 and 27 components. Approximately one-third (n=8) (22,28,31,35,40,42-44) of the revised studies evaluated DP underwent modifications from their original versions. The categorization of consumption according to established DP was mainly done into quintiles (n=5) (30,33,40,41,42), quartiles (n=4) (25,27,29,32), and tertiles (n=3) (22,31,43) to describe the association between exposure and outcome(s) of interest.

A posteriori-defined DP: Among the eight studies adopting a posteriori-defined DP (22–26,28,33,35) half of them (n = 4) (24,36,39,45) defined two DP, while the remaining identified three (n = 3, 37.5%) (26,34,38) or four (n = 1, 12.5%) (37). The Prudent (n=5, 62.5%) and Traditional (n=3, 37.5%) DP are the most frequently investigated. Regarding the DP definition, seven studies adopted the Principal Component Analysis (PCA) (23–26,28,33,35), whereas one study used the Factor Analysis (FA) (40) (Supplementary Table S2).

Mainly findings of studies

COPD risk or presence: Figure 4 summarises the association between healthy and unhealthy DP and risk, or presence of COPD found in the revised studies. Seven longitudinal studies (30,32,39-42,45) evaluated the association between DP and the risk of COPD and five of them demonstrated a significant association between DP and the risk of COPD: Plant Centred Diet (30), Prudent Diet (39), higher score on Alternative Healthy Eating Index (AHEI-2010) (40), Healthful Plant-Based (41), Dutch Dietary Guidelines-2015 adherence (42), and Balanced Diet were associated with a lower risk of COPD, whereas a higher score on DII (32), Unhealthful Plant-Based (41), and Westernized Diet (39) were associated with increased risk of COPD. Two studies found no association between Med Diet (32) and Traditional Northern diet (45) and COPD risk. Three case-control studies evaluated the association between MedDiet (28), HEI-2010 (29) and Low-Carbohydrate Diet (33) with the odds of COPD, demonstrating a significant association between a higher adherence to these DP and this outcome.

Among the nine cross-sectional studies evaluating the association between DP and the presence of COPD, Prudent Diet (24,36), lower score on DII (31), and DASH diet (43) were associated with lower odds of COPD presence. On the other hand, MedDiet (43), Cosmopolitan Diet and Refine-food DP (34), Prudent (37,38) Traditional Western (36, 37,38), High Carbohydrate Diets (38), White Rice DP (37), HEI-2010 (27), and DII (25) exhibited no association with COPD presence.

Clinical outcomes in COPD patients: Four studies were conducted in COPD patients (23, 26, 35, 44). One study showed a higher fatigue score among patients with lower MEDAS adherence and a higher MEDAS score in independently grouped patients according to the ADL scale (23). Depression risk assessed by the Beck Depression Inventory was evaluated in one study, which demonstrated an inverse association between Healthy Diet and Mixed Diet and this outcome. Two studies were conducted in the same sample and evaluated the association between HEI-2005, HEI-2010, and Mediterranean score with different outcomes (35, 44): none DP was associated with COPD severity (44), whereas all patterns were inversely correlated with sleep quality score (35). Only one study assessed lung function as an outcome and demonstrated a significant association between a Mixed Diet and higher forced expiratory volume in one second and forced vital capacity (FEV_1/FVC), with no association observed with Healthy and Unhealthy DP (26). A case-control study (22) assessed respiratory symptoms, showing an inverse association between the DASH diet and cough frequency but not with phlegm and breathlessness (it is unclear whether the analyses included both COPD and non-COPD patients). Supplementary Figure S2 summarises these data.

Studies Limitations

Supplementary Tables 3, 4 and 5 presents a detailed evaluation of the methodological quality assessment of the studies. Among the cross-sectional studies (n = 13), the NOS score ranged from 2 to 8 stars, with only three justifying sample size. In the case-control studies (n = 4), the

NOS score ranged from 5 to 7 stars, with none assessing the item "ascertainment of exposure" was not scored by any study. The NOS score ranged from 5 to 8 stars among the cohort studies (n = 7), with the lowest scored item also being the "ascertainment of exposure" (n = 1).

Regarding other relevant methodological aspects, eight studies did not utilise the reference method (spirometry) for COPD diagnosis (28,31,39-43,45); instead, they relied on self-reports or medical records. No study reported evaluating the reliability of the method for dietary intake or how it was done. Only three studies reported the sample size estimation (22,23,29).

DISCUSSION

Main findings

This scoping review mapped the evidence on the association between DP and COPD risk and clinical outcomes in patients diagnosed with the disease. The main findings were as follows: 1) Most studies evaluated the association between different DP and the presence or risk of COPD, demonstrating a protective role of healthy DP; 2) Several outcomes were evaluated in four studies involving COPD patients, including fatigue, sleep quality, depression, ADL, and disease severity, showing a potential beneficial role of healthy patterns for these clinical outcomes in patients with diagnosed disease; 3) The main DP evaluated were the Med Diet (n = 6) and HEI (n = 5); 4) Most studies adopted an a priori-defined DP(n = 16) for DP assessment.

The protective role of healthy DP for COPD development

Dietary patterns offer an overview of diet and provide an adequate means to assess the relationship between diet and COPD. The Med Diet emerged as the most frequent DP evaluated in the studies included in our scoping review. Researchers primarily used the FFQ in evaluating adherence to Med Diet. Numerous studies have highlighted the health benefits associated with adherence to the Med Diet, particularly in the context of chronic diseases (50-54). Rich in fruits, vegetables, whole grains, olive oil, nuts, and fish, the Med Diet has demonstrated associations with reduced risk and improved management of various chronic conditions, including cardiovascular disease, type 2 diabetes, and certain cancers (50,55). The high intake of antioxidants, polyphenols, and omega-3 fatty acids found in these foods seems to mediate these protective effects (56). Research reveals that emphasising plant-based foods and monounsaturated fats (MUFA) in the Med Diet reduces inflammation, improves lipid profiles, and enhances insulin sensitivity. These effects are crucial in preventing and managing chronic diseases such as COPD (47,57). An imbalance in antioxidants can influence COPD, particularly among smokers whose circulating neutrophils produce more oxidative molecules, leading to bronchial hyper-responsiveness. This relationship suggests a pathogenetic pathway between oxidative stress and airway abnormalities in COPD (58,59).

Data from the NHANES III demonstrated a significant association between lung function and serum antioxidants vitamin C and E, selenium, and beta-carotene (34). The Dutch MORGEN study showed a positive and significant correlation between antioxidant intake and FEV_1, a significant strong prognostic indicator of COPD (60). Other epidemiological studies have also confirmed the association between dietary intake of Med Diet components, such as high intake of fruits and vegetables, and COPD mortality (61). On the other hand, high intakes of saturated fatty acids may exacerbate airway inflammation (62). Another possible mechanism is the influence of intestinal microbiota since dietary fibre - present in high amounts in the Med Diet and other healthy DP - can lead to changes in the composition of intestinal and lung microflora, protecting individuals from allergic inflammation of the lungs (63).

In the studies included in this scoping review, HEI was the second most frequent DP investigated and researchers primarily assessed dietary intake for calculating HEI using FFQ. The HEI is a measure of diet quality that evaluates the adherence to the American dietary guidelines (64) and beneficially impacts health outcomes, including obesity, diabetes, and overall mortality in previous publications (65-70). Higher HEI-2010, as higher adherence to Med Diet and other healthy DP, reflects high intakes of vegetables, fruits, whole grains, polyunsaturated fatty acids, MUFA, nuts, as well as low intakes of red and processed meat, refined grains, empty calories, and sodium. All these dietary characteristics are related to better lung function (71). When investigating the association between isolated components of the HEI and the risk of COPD, studies found that a high intake of fruit and whole grains, along with a low intake of red and processed meat and sugar-sweetened drinks were associated with reduced COPD risk (40), reinforcing previous findings related to the respiratory benefits of healthy DP, in concordance with the antioxidant and anti-inflammatory diet hypothesis.

In general, the benefits of healthy DP (such as prudent, Dash, Mediterranean, and balanced diets) related to COPD prevention may result from their high amounts of fruits, vegetables, whole grains, legumes, nuts, fish that provide high antioxidants, vitamins, fibres and unsaturated fats. These foods and nutrients probably impact on inflammation, oxidative stress, antioxidant depletion, mucus hypersecretion, alveolar wall destruction, defective tissue repair and airway remodelling, which are part of the disease pathogenesis. On the other hand, unhealthy DP (such as Western diets rich in refined foods, saturated fat, meat and sugar, and DII) exhibit a negative interaction with these markers of lung function and COPD development and progression (71).

The benefits of healthy DP for patients with COPD diagnosis

Only four eligible studies for this scoping review evaluated the association between DP and clinical outcomes in COPD patients, including lung function, respiratory symptoms, fatigue, ADL, sleep quality, depression, and disease severity. Healthy, Unhealthy, Mediterranean, Mixed Diet and higher adherence to HEI and DII scores were the DP studied and the results were heterogeneous and the benefits of healthy DP for patients with COPD needs to be more explored in future studies.

We can speculate that a diet rich in fruits and vegetables, whole grains, and lean proteins, provides essential nutrients such as vitamins, minerals, and antioxidants that may mitigate the chronic inflammation and oxidative stress characteristic of COPD, potentially reducing disease progression and exacerbation risk. A healthy diet supports overall immune function and respiratory muscle strength, which are crucial for maintaining lung function and respiratory health in individuals with COPD and is often associated with reduced body adiposity, which can alleviate the mechanical burden on the respiratory system and improve exercise tolerance. Overall, adopting healthy dietary habits can play a significant role in optimising clinical outcomes and quality of life in patients with COPD (69,70).

A priori or a posteriori-defined DP

Considering that most of the studies included in this scoping review employed a priori methodology to assess DP, it's crucial to discuss their advantages and limitations. While dietary quality scores are theoretically grounded in scientific evidence for health and disease prevention (71) and are easily interpretable and applicable across various settings due to their simplicity in interpretation and calculation (72), the ongoing lack of consensus on the healthiest diet hinders their practical application (73) by. It is evident in the several scores attempting to evaluate overall dietary quality. Dietary quality scores monitor people's adherence to dietary guidelines, assess the overall quality of a population's diet, or predict diseases (72). However, they do not adequately describe the overall DP, often focusing on selected aspects and neglecting the correlated structure of components (73). Developing DP requires arbitrary choices, such as determining which items to include, the scoring system, and cut-off values, lacking clear justification and insight. The subjectivity introduced in this process compromises the predictive capacity of DP for health outcomes (71,73).

The a posteriori method offers a more detailed representation than the a priori one (74). However, it also demands subjective decisions from researchers during analysis, particularly when creating food groups as input variables. This subjectivity is apparent in the wide range of food groupings seen in the literature, influenced by factors like existing categorization systems, culinary uses, and behavioural aspects of food consumption. Such variability in food groupings may weaken associations between DP and health outcomes, suggesting a loss of important information. Including more detailed food information could enhance understanding of these associations (75).

Methodological concerns on studies evaluating COPD and DP

The assessment of dietary intake in revised studies included FFQ and 24-h DR, both of which have inherent limitations. These limitations include poor measurement of usual intake due to daily variation in food consumption (especially for 24-h DR), the semi-quantitative nature of the assessment (particularly for FFQs), measurement error, variation in diet definitions, and the lack of external validation of study findings among different populations (76). Indeed, studies scarcely reported a measure of reliability for dietary intake assessment.

Most studies investigating the association of diet with lung function and COPD addressed confounding bias by adjusting for multiple factors known to influence pulmonary function or dietary behaviour. These factors included age, gender, BMI, physical activity, consumption of other foods or nutrients, energy intake, educational level, and tobacco exposure. However, the adjustment for these factors was highly heterogeneous among the studies, precluding an appropriate comparison of their findings.

The reference method for diagnosing COPD is spirometry, with the disease diagnosed when the FEV_1/FVC ratio post-bronchodilator is lower than 0.7 (5). While most studies included in this scoping review adopted this approach for COPD diagnosis, five studies considered self-report diagnosis, and four studies followed medical registers to define the presence of the disease. These approaches may inaccurately underestimate diagnoses, potentially influencing the association between DP and the presence/incidence of COPD.

When evaluated using the Newcastle-Ottawa Scale (NOS), a low number of cross-sectional studies scored well on the justified sample size question. Failure to calculate sample size can result in underpowered studies, lacking the necessary statistical strength to detect true associations. This possibility can lead to inconclusive or misleading findings, wasting resources and potentially yielding incorrect conclusions. Case-control studies scored lower on the question of "selection of controls." Inadequate control selection can lead to selection bias, where the control group does not adequately represent the population from which the cases were drawn, leading to inaccurate estimates of exposure-outcome associations. Such practices could compromise the study's internal validity and the validity, reliability and trustworthiness of its findings. None of the case-control studies scored well on the question of "ascertainment of exposure," highlighting a gap in ensuring the quality and credibility of these studies' findings.

Strengths and weakness

We followed the JBI recommendations (14) for scoping review conduction and reported it according to the PRISMA-ScR (77). We searched the literature in four databases without language or data of publication restriction. However, we cannot ensure its sufficiency to cover all literature on this topic since we did not explore the grey literature.

Gaps and future research

The literature lacks significant investigation of potential associations between DP and clinical outcomes in COPD patients. When managing COPD patients, assessing their functional capacity, quality of life, exacerbation and hospitalisation frequency, lung function parameters, indicators of nutritional status, and muscle mass is crucial. However, no studies have identified the association between DP and these outcomes. We hypothesise that healthy DP may correlate positively with improved outcomes, but further exploration is required to formulate research questions to be addressed by clinical trials testing the effects of healthy dietary interventions in COPD patients.

The complexity of studying DP and their associations with health outcomes necessitates the integration of the multidimensionality of DP, considering how it is measured, defined, and modelled. Additionally, it entails recognizing the dynamic nature of diet over the life course and its potential influence on disease prevention and control (48). Also, individual variation in responses to dietary intake, particularly diet-genes interactions, is an underexplored area in Nutritional Epidemiology, potentially clarifying mixed findings on diet and health outcomes. Considering the investigation of DP alongside the assessment of genetic factors could provide deeper insights, informing future projects and improving the assertiveness of preventive and therapeutic nutritional interventions.

Therefore, future research should prioritise investigating associations between DP and diverse clinical outcomes in COPD patients, as this evidence is currently lacking. Additionally, researchers should strive to enhance the completeness of reporting in studies aimed at improving the reproducibility and transparency of dietary intake assessment methodologies.

Conclusions

This scoping review revealed that most studies investigating DP and COPD focused on assessing the risk of developing the disease rather than exploring clinical outcomes in diagnosed patients. A priori-defined DP was most utilised, primarily evaluating the Med Diet and adherence to the HEI score. Overall, the analysed studies found that healthy DP is related to a reduced risk of COPD and improved outcomes in diagnosed patients. However, detailed information regarding dietary intake assessment was often lacking in most studies, hindering its translation into clinical practice. Future studies should aim to investigate the association between DP and various clinical outcomes, such as functional capacity, lung function, disease severity, nutritional status, muscle mass, quality of life, symptoms, and exacerbation rates, incorporating assessment of diet-genes interaction.

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Conflict of interest

The authors declare that they have no conflict of interest.

Author Contribution

Author contributions: SB and FMS contributed to the conception and design of the research; CI, PZ, and SB conducted the acquisition of the data; SB and CI contributed to the analysis of the data. SB, CI, and FMS wrote the manuscript. All authors critically reviewed, interpreted, and approved the final version of this manuscript.

Availability of data and materials

Upon reasonable request.

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Table 1. Population, concept, and context (PCC), and eligible criteria of the proposed scoping review.

	Inclusion criteria	Exclusion criteria
Population	Male and female adults (age ≥ 18) from the general population and COPD individuals.	Pregnant or breastfeeding women
Concept	Dietary patterns	Studies measuring the exposure to individual components of diet such as food groups, specific foods, nutrients, or dietary supplements.
Context	From any setting	NA

Abbreviations: COPD, chronic obstructive pulmonary disease; NA, not applicable.

Table 2. General characteristics of studies evaluating the association between respiratory health outcomes and dietary patterns in COPD and No COPD individuals.

First author, year (ref)	Study Design, Context, Country	Participant information *	Dietary patterns and assessment methods	Outcomes and assessment methods	Key Relevant Findings
Ardestani, 2017 (22)	Case-control Outpatient pulmonary clinic hospital-based Iran	COPD (n = 84) and No COPD individuals (n = 80, 56.7 ± 12.03 years , 89.1% males)	DASH score FFQ	Lung function by spirometry and self-reported respiratory symptoms .	T3 of DASH diet was associated with lower frequency of cough, but it was not associated with other symptoms and markers of lung function (*)
Arslan, 2023 (23)	Cross-sectional Inpatient hospital-based Turkey	COPD inpatients (n= 526, 73.4 ± 4.9 years, 59% males)	MEDAS	ADL by Katz activities and Fatigue by COPD and Asthma Fatigue Scale.	Lower MEDAS adherence was associated with higher fatigue score and higher MEDAS score was observed in independent individuals according to the ADL scale (#)

Brigham, 2018 (24)	Cross-sectional Community USA	General population individuals (n= 15,258, 54.2 ± 5.8 years, 55.4% males)	Prudent and Westernised diet FFQ	COPD by spirometry and self-reported respiratory symptoms.	Q5 of Prudent Diet was inversely associated with COPD presence (*).
Chen, 2022 (25)	Cross-sectional Community USA	General population individuals (n = 3,962, 20 - 49 years, 52% males)	DII 24hDR or food records.	Early COPD and lung function by spirometry	Q4 of DII was not associated with early COPD presence (*) DII score was inversely associated with FEV_1, CVF, FEV_1/CVF in all participants and in those without early COPD (#)
Dinparast, 2021 (26) .	Cross-sectional Outpatients from a Lung research centre in the Tabriz University Iran	COPD outpatients (n= 220, 54.6 ± 5.1 years, 57% males)	Healthy, Mixed, and Unhealthy Diet FFQ	Depression risk by Beck Depression Inventory-II and lung function by spirometry	Healthy diet and Mixed diet were inversely associated with depression whereas it was not associated with Unhealthy diet (*) Mixed Diet was associated with higher FEV_1/FVC whereas no association between lung function markers and the other DP was observed (#)

Ducharme-Smith, 2021 (27)	Cross-sectional Community USA	General population individuals (n= 10,428, 42.9 ± 14.7 years, 49% males)	AHEI-2010 24hDR	COPD and spirometric restriction (FVC lower than lower limit normal) by spirometry	Higher quartile of AHEI-2010 was associated with lower odds of spirometric restriction, but not with COPD presence (*)
Fischer, 2019 (28)	Case-control Community and outpatient from a respiratory clinic Sweden	COPD (n = 370) and Controls individuals (n = 1,432, 55 (30 - 61) years, 43% males]	MDS FFQ	COPD by medical registers	Higher adherence to MDS (6-8 points) was associated with lower COPD odds, specially due to the consumption of fruits (*)
Ghosn, 2023 (29)	Case-control Outpatients from the pulmonology clinic and other clinics Iran	COPD (n = 84) and Controls individuals (n = 252) (age 55.6 ± 12.3, 89% males)	HEI-2010 FFQ	COPD by spirometry and physician diagnosis	Q4 of HEI-2010 score was inversely associated with COPD odds (*).
Jackson, 2023 (30)	Secondary analysis of a	Ever smoker (smoking at any time	A Priori Diet Quality Scores	Emphysema by computed tomography scan.	Q5 of ADQS was associated with lower risk of emphysema (*).

	prospective study (Follow-up 30 y) Community USA	at age <20) individuals (n = 1,351, 25.5±3.5 years, 41.6% males)	(ADQS)- Plant Centred Diet Diet history		
Liu, 2021 (31)	Cross-sectional Community USA	General population individuals (n= 9,929, 59.8 ± 6.7 years, 54% males)	DII 24hDR	COPD, self-reported.	T3 and T2 of DII score (lowest values) were associated with lower odds of COPD (*).
Maisonneuve, 2016 (32)	Prospective cohort (Follow-up 8.5 y) Community Italy	Heavy smoker (≥20 pack-year) (n= 5,203; 57.5 [50–84] years, 66.1% males)	DII and AMDS FFQ	Emphysema risk by CT-scan	Q4 of AMDS score (8-9 points) was not associated with any outcome whereas Q4 of DII score (highest values) were associated with increased risk of emphysema (*).

Malmir, 2021 (33)	Case-control Inpatient hospital-based Iran	COPD (n = 84) and Healthy controls inpatients (n = 252, 55.6 ± 9.4 years, 89% males)	Low-Carbohydrate Diet FFQ	COPD by spirometry	Lower carbohydrate intake (Q5) was associated with a reduced COPD odds (*).
McKeever, 2010 (34)	Cross-sectional Community Netherlands	General population individuals (n = 12,648; 41.5 ± 11.23 years, 48% males)	Traditional, Cosmopolitan, and Refined-foods 24-h DR	COPD and lung function by spirometry	High adherence (Q5) to Cosmopolitan and Refined-foods Diet were not associated with COPD presence whereas higher adherence (Q5) to Traditional diet was associated with higher odds of COPD presence (*).
Paknahad, 2020 (35)	Cross-sectional Patients in Tehran Hospital Iran	COPD individuals (n= 121, 66.1 ± 10.9 years, 85% males)	HEI-2005, HEI-2010, and MED score FFQ	Sleep quality by PSQI scale.	MED score was inversely correlated with PSQI score in males and non-smokers whereas HEI-2005 and HEI-2010 score were inversely correlated with PSQI only in males (#)
Shaheen, 2010 (36)	Cross-sectional Community England	General population individuals (n= 2,942; 66.1 ± 2.9 years, 53% males)	Prudent and Traditional Diet FFQ	COPD by spirometry	Q5 of Prudent Diet (higher adherence) was associated with lower risk of COPD in males whereas Traditional Diet was not associated with COPD presence (*)

Shin, 2021 (37)	Cross-sectional Community South Korea	General adult population individuals (n= 5,436; 54.6 ± 8.2 years, 48% males)	Coffee, fat, and sweet, Prudent, Westernized, and White rice Diets FFQ	COPD by spirometry	In males, the Prudent, Westernized and White Rice DP were not associated with risk of COPD whereas the coffee, fat and sweet DP (Q4 - higher score) was associated with increased risk of COPD. In females no DP were associated with COPD presence (*).
Steinemann, 2018 (38)	Cross-sectional Community Switzerland	General population adults (n= 2,178; 58.6 ± 10.6 years, 46% males)	Prudent, Traditional Western, and High-carbohydrate Diet FFQ	COPD by spirometry	None DP was associated with COPD presence (*)
Varraso, 2007 (39)	Secondary analysis of a prospective study	Lung disease free health professionals (n= 42,917; 40- 75 years, 100% males)	Prudent and Westernized Diet FFQ	COPD self-reported symptoms and medical records (pulmonary diagnostic tests)	Q5 of Prudent Diet (highest adherence) was associated with lower risk of COPD whereas Q5 of Westernized Diet was associated with increased risk of COPD (*).

	(Follow-up 12 y) Health professional settings USA				
Varraso, 2015 (40)	Prospective cohort (Follow-up 14 y) Health professional settings USA	Health professionals (n= 120,254; 50.3 ±7.1 [females] and 54.0 ±9.6 [females] years, 39% males)	AHEI-2010 FFQ	COPD, self-reported and confirmed by medical records (pulmonary diagnostic tests)	Q5 of AHEI-210 score (highest values) was associated with lower risk of COPD both in ex-smokers and current smokers (*).
Varraso, 2023 (41)	Retrospective cohort (Follow-up 34 y) Health professional settings	Health professionals (n = 206,055; 25-75 years, 23% males)	Healthful and Unhealthful Plant-based Diet Indexes FFQ	COPD, self-reported and confirmed by medical records (pulmonary diagnostic tests)	Q5 of Healthful Plant-based diet index (highest adherence) was associated with lower risk of COPD whereas higher adherence to unhealthful plant-based diet was associated with increased risk of COPD (*).

	USA				
Voortman, 2017 (42)	Prospective cohort (Follow-up 13.5 y) Community Netherlands	General population individuals (n= 9,351; 64.1 [49.0-82.8] years, 42% males)	DDG-2015 FFQ	COPD by spirometry or medical records (COPD medication use and physician diagnosis).	Higher scores of adherence to the DDG-2015 were associated with a lower risk of COPD (*).
Wen, 2023 (43)	Cross-sectional Community USA	General population individuals (n= 28,095; 57.2 ± 4.8 years, 42.5% males)	DASH diet score and Mediterranean Diet Index 24HDR.	COPD, self-reported.	Mediterranean Diet Index was not associated with COPD presence whereas T3 of DASH score (highest adherence) was associated with a lower odds of COPD presence (*).
Yazdanpanah, 2016 (44)	Cross-sectional Patients in Tehran Hospital Iran	COPD individuals (n= 121; 66.1 ± 10.9 years, 85% males)	HEI-2005, HEI-2010, and MED Score FFQ	COPD severity categorised according to GOLD guidelines.	None DP score differed between patients grouped according to COPD stages (#)..

Yu, 2022 (45)	Prospective cohort (Follow-up 11 y) Community China	Lung disease free individuals (n= 421,426; 50.6 ± 10.3 years, 40% males)	Balanced and Traditional northern Diet FFQ	COPD by the National Health Insurance system linked to hospitalisation records.	Q5 of Balanced diet was associated with lower risk of COPD whereas the Traditional northern diet was not associated with COPD risk (*).

*** results of adjusted analyses for confounders. # Results of bivariate analyses or crude multivariate analyses.**

Abbreviations: COPD, chronic obstructive pulmonary disease; DASH, dietary approaches to stop hypertension; FFQ, food-frequency questionnaire; FEV_1, forced expiratory volume in first second; FVC, forced vital capacity; FEV_1/FVC, forced expiratory volume in first second: forced vital capacity ratio; USA, United States of America; 24h DR, 24-hour dietary recall; MEDAS, Mediterranean Diet Adherence Screener; ADL, Activities of daily living; DII, Dietary Inflammatory Index; AHEI-2010, Alternative Healthy Eating Index 2010; MDS, Mediterranean Diet Score; HEI-2010, Healthy Eating Index 2010; AMDS, Alternate Mediterranean diet score; GOLD, Global Initiative for Chronic Obstructive Lung Disease; HEI-2005, Healthy Eating Index 2005; MED score, Mediterranean-diet score; PSQI, Pittsburgh Sleep Quality Index; DP, Dietary Pattern; DDG-2015, Dutch Dietary Guidelines 2015; DASH, Dietary Approaches to Stop Hypertension;

Figures

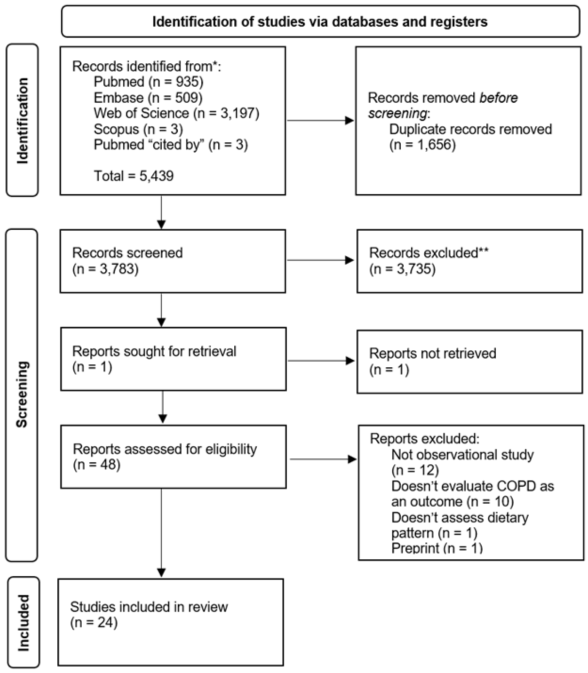

Figure 1. Flowchart of study selection.

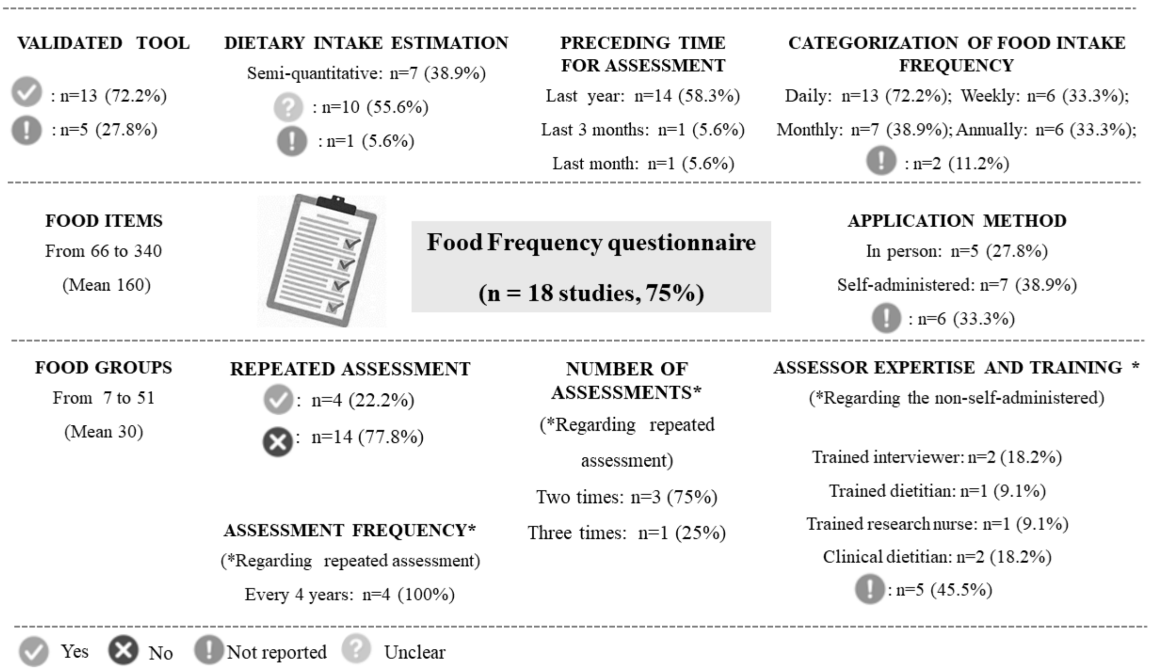

Figure 2. Details of revised studies related to the food frequency questionnaires applied to determine the dietary patterns.

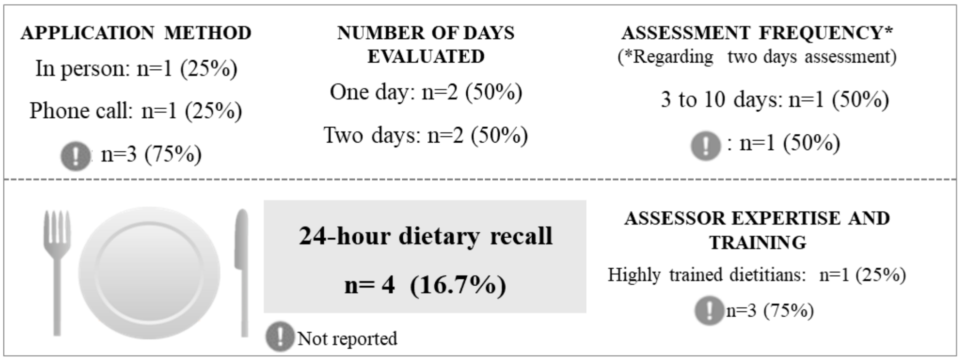

Figure 3. Details of revised studies related to the 24-h dietary recall applied to determine the dietary patterns.

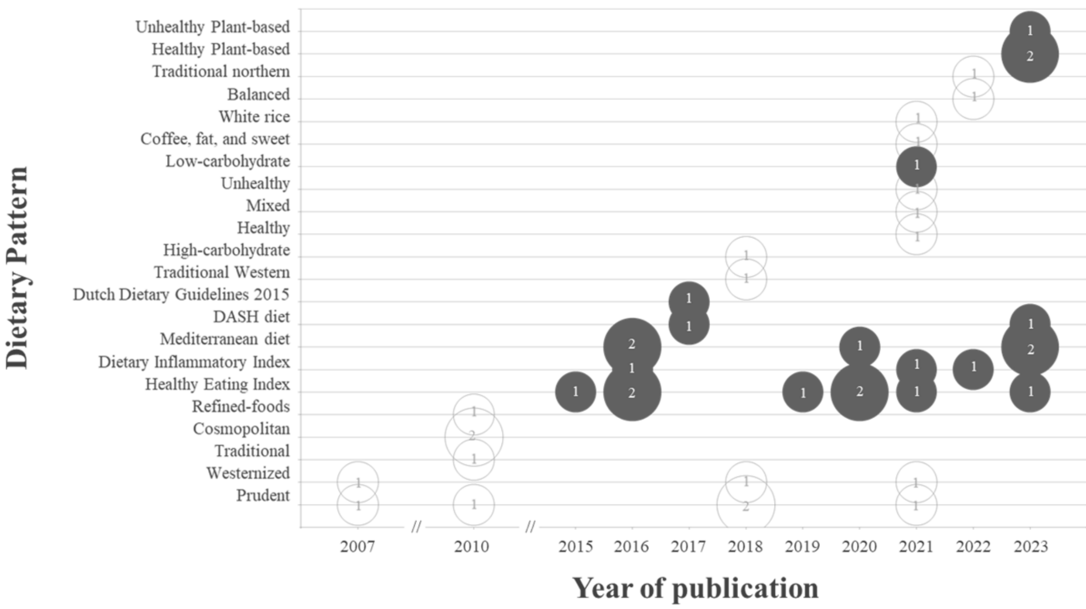

Figure 4. Bubble chart showing the frequency of studies evaluating a priori (black bubbles) or a posteriori-defined (white bubbles) dietary patterns according to the year of publication.

Risk or presence of COPD (n = 20 studies)

Healthy dietary patterns	⬇	⊗
Prudent Diet (n = 5)	60%	40%
Dash Diet (n = 1)	100%	
Mediterranean Diet (n = 3)	33.3%	66.7%
HEI (n = 3)	66.7%	33.3%
Plant-Centred Diet (n=1)	100%	
Low-Carb Diet (n= 1)	100%	
Healthful Plant-Based Diet (n = 1)	100%	
DDG-2015 (n= 1)	100%	
Balanced Diet (n = 1)	100%	

Unhealthy dietary patterns	⬆	⊗
Traditional Diet (n = 1)	100%	
Cosmopolitan Diet (n = 1)		100%
Refined Food Diet (n = 1)		100%
Coffee, fat and sweet Diet (n = 1)	100%	
Westernized Diet (n = 4)	50%	50%
White Rice Diet (n = 1)		100%
High-Carb Diet (n = 1)		100%
Unhealthful Plant-Based Diet (n = 1)	100%	
Traditional Northern Diet (n= 1)		100%
DII (n = 2)	50%	50%

⬇ Inverse association ⬆ Positive association ⊗ No significant association

Figure 5. Healthy and unhealthy dietary patterns and risk or presence of COPD: number of studies, significance and Direction of the association. Abbreviations: DII, Dietary Inflammatory Index; HEI, Healthy Eating Index; DDG-2015, Dutch Dietary Guidelines 2015; DASH, Dietary Approaches to Stop Hypertension.

Supplementary Material

Box S1. Research questions of the proposed scoping review.

Primary question:

What is the evidence on dietary patterns associated with COPD risk and clinical outcomes in patients with COPD?

Sub-questions:

1) What were the study aims?
2) Which dietary patterns have been investigated?
3) How have dietary patterns been evaluated ?
4) Which COPD outcomes have been assessed?
5) What are the main methodological limitations of primary studies?
6) What are the major findings related to dietary patterns and COPD prevention and management?
7) What questions still need to be addressed in future studies?

Box S2. Search strategy in all databases.

Pubmed:

("pulmonary disease chronic obstructive"[Title/Abstract] OR "COPD"[Title/Abstract] OR "chronic obstructive pulmonary disease"[Title/Abstract] OR "COAD"[Title/Abstract] OR "chronic obstructive airway disease"[Title/Abstract] OR "chronic obstructive lung disease"[Title/Abstract] OR "airflow obstruction chronic"[Title/Abstract] OR "airflow obstructions chronic"[Title/Abstract] OR "chronic airflow obstructions"[Title/Abstract] OR "chronic airflow obstruction"[Title/Abstract] OR "bronchitis chronic"[Title/Abstract] OR "pulmonary emphysema"[Title/Abstract] OR "lung diseases obstructive"[Title/Abstract] OR "lung disease obstructive"[Title/Abstract] OR "obstructive lung disease"[Title/Abstract] OR "obstructive lung diseases"[Title/Abstract] OR "obstructive pulmonary diseases"[Title/Abstract] OR "obstructive pulmonary disease"[Title/Abstract] OR "pulmonary disease obstructive"[Title/Abstract] OR "pulmonary diseases obstructive"[Title/Abstract] OR "alpha 1 antitrypsin deficiency"[Title/Abstract] OR "copd severe early onset"[Title/Abstract]) AND
(((Diet*[Title/Abstract]) OR ("Diets"[Title/Abstract])) OR ("Dietary Pattern"[Title/Abstract])) OR ("Diet, Vegan"[Title/Abstract])) OR ("Diets, Vegan"[Title/Abstract])) OR ("Vegan Diets"[Title/Abstract])) OR ("Vegan Diet"[Title/Abstract])) OR ("Veganism"[Title/Abstract])) OR ("Diet, High-Protein"[Title/Abstract])) OR ("Diet, High Protein"[Title/Abstract])) OR ("Diets, High-Protein"[Title/Abstract])) OR ("High-Protein Diets"[Title/Abstract])) OR ("High-Protein Diet"[Title/Abstract])) OR ("High Protein Diet"[Title/Abstract])) OR ("Diet, Mediterranean"[Title/Abstract])) OR ("Mediterranean Diet"[Title/Abstract])) OR ("Diets, Mediterranean"[Title/Abstract])) OR ("Mediterranean Diets"[Title/Abstract])) OR ("Diet, Vegetarian"[Title/Abstract])) OR ("Diets, Vegetarian"[Title/Abstract])) OR ("Vegetarian Diets"[Title/Abstract])) OR ("Vegetarian Diet"[Title/Abstract])) OR ("Lacto-Vegetarian Diet"[Title/Abstract])) OR ("Diet, Lacto-Vegetarian"[Title/Abstract])) OR ("Diets, Lacto-Vegetarian"[Title/Abstract])) OR ("Lacto Vegetarian Diet"[Title/Abstract])) OR ("Lacto-Vegetarian Diets"[Title/Abstract])) OR ("Plant-Based Diet"[Title/Abstract])) OR ("Diets, Plant-Based"[Title/Abstract])) OR ("Plant Based Diet"[Title/Abstract])) OR ("Plant-Based Diets"[Title/Abstract])) OR ("Diet, Plant-Based"[Title/Abstract])) OR ("Diet, Plant Based"[Title/Abstract])) OR ("Plant-Based Nutrition"[Title/Abstract])) OR ("Nutrition, Plant-Based"[Title/Abstract])) OR ("Plant Based Nutrition"[Title/Abstract])) OR ("Lacto-Ovo Vegetarian Diet"[Title/Abstract])) OR ("Diet, Lacto-Ovo Vegetarian"[Title/Abstract])) OR ("Diets, Lacto-Ovo Vegetarian"[Title/Abstract])) OR ("Lacto Ovo Vegetarian Diet"[Title/Abstract])) OR ("Lacto-Ovo Vegetarian Diets"[Title/Abstract])) OR ("Vegetarian Diet, Lacto-Ovo"[Title/Abstract])) OR ("Vegetarian Diets, Lacto-Ovo"[Title/Abstract])) OR ("Vegetarianism"[Title/Abstract])) OR ("Dietary Approaches To Stop Hypertension"[Title/Abstract])) OR ("DASH Diet"[Title/Abstract])) OR ("DASH Diets"[Title/Abstract])) OR ("Diet, DASH"[Title/Abstract])) OR ("Diets, DASH"[Title/Abstract])) OR ("Dietary Approaches To Stop Hypertension Diet"[Title/Abstract])) OR ("Diet Therapy"[Title/Abstract])) OR ("nutritional management"[Title/Abstract])) OR ("dietary management"[Title/Abstract])) OR ("Nutrition therapy"[Title/Abstract])) OR ("Therapy, Nutrition"[Title/Abstract])) OR ("Medical Nutrition Therapy"[Title/Abstract])) OR ("Nutrition Therapy, Medical"[Title/Abstract])) OR ("Therapy, Medical Nutrition"[Title/Abstract])) OR ("Diet, Western"[Title/Abstract])) OR ("Diets, Western"[Title/Abstract])) OR ("Western Diets"[Title/Abstract])) OR ("Western Dietary Pattern"[Title/Abstract])) OR ("Dietary Pattern, Western"[Title/Abstract])) OR ("Dietary Patterns, Western"[Title/Abstract])) OR ("Pattern, Western Dietary"[Title/Abstract])) OR ("Patterns, Western Dietary"[Title/Abstract])) OR ("Western Dietary Patterns"[Title/Abstract])) OR ("Diet, Occidental"[Title/Abstract])) OR ("Diets, Occidental"[Title/Abstract])) OR ("Occidental Diet"[Title/Abstract])) OR ("Occidental Diets"[Title/Abstract])) OR ("Western Diet"[Title/Abstract])) OR ("Meat-Sweet Diet"[Title/Abstract])) OR ("Diet, Meat-Sweet"[Title/Abstract])) OR ("Diets, Meat-Sweet"[Title/Abstract])) OR ("Meat Sweet Diet"[Title/Abstract])) OR ("Meat-Sweet Diets"[Title/Abstract])) OR ("Diet, Healthy"[Title/Abstract])) OR ("Diets, Healthy"[Title/Abstract])) OR ("Healthy Diets"[Title/Abstract])) OR ("Healthy Eating"[Title/Abstract])) OR ("Eating, Healthy"[Title/Abstract])) OR ("Healthy Diet"[Title/Abstract])) OR ("Healthy Nutrition"[Title/Abstract])) OR ("Nutrition, Healthy"[Title/Abstract])) OR ("Prudent Diet"[Title/Abstract])) OR ("Diet, Prudent"[Title/Abstract])) OR ("Diets, Prudent"[Title/Abstract])) OR ("Prudent Diets"[Title/Abstract])) OR ("Healthy Eating Index"[Title/Abstract])) OR ("Healthy Eating Indices"[Title/Abstract])) OR ("Index, Healthy

Eating"[Title/Abstract])) OR ("Indices, Healthy Eating"[Title/Abstract]))
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Web of Science: ((((((((((((((((((((((((TS=(diet)) OR TS=('dietary pattern')) OR TS=('vegan diet')) OR TS=('protein diet')) OR TS=('Mediterranean diet')) OR TS=('mediterranean diet score')) OR TS=('mediterranean diet quality index')) OR TS=('mediterranean diet adherence screener')) OR TS=('vegetarian diet')) OR TS=('fruitarian diet')) OR TS=('lactovegetarian diet')) OR TS=('ovovegetarian diet')) OR TS=('pescovegetarian diet')) OR TS=('DASH Diet')) OR TS=('Diet Therapy')) OR TS=('Western Diet')) OR TS=('Western Dietary Pattern')) OR TS=('Healthy Diet')) OR TS=('healthy diet indicator')) OR TS=('healthy diet score')) OR TS=('healthy dietary pattern')) OR TS=('Healthy Eating Index')) OR TS=('Healthy Eating Index 2015')) OR TS=('Healthy Eating Index 2010')) OR TS=('Healthy Eating Index 2005')) OR TS=('prudent diet')) OR TS=('prudent dietary pattern') AND ((((((TS=('lung disease')) OR TS=('chronic obstructive lung disease')) OR TS=('respiratory tract disease')) OR TS=('airway obstruction')) OR TS=('chronic bronchitis')) OR TS=('lung emphysema')) OR TS=('alpha 1 antitrypsin deficiency')
Scopus: (TITLE-ABS-KEY (diet) OR TITLE-ABS-KEY ('dietary AND pattern') OR TITLE-ABS-KEY ('vegan AND diet') OR TITLE-ABS-KEY ('protein AND diet') OR TITLE-ABS-KEY ('mediterranean AND diet') OR TITLE-ABS-KEY ('mediterranean AND diet AND quality AND index') OR TITLE-ABS-KEY ('mediterranean AND diet AND score') OR TITLE-ABS-KEY ('mediterranean AND diet AND adherence AND screener') OR TITLE-ABS-KEY ('vegetarian AND diet') OR TITLE-ABS-KEY ('fruitarian AND diet') OR TITLE-ABS-KEY ('lactovegetarian AND diet') OR TITLE-ABS-KEY ('ovovegetarian AND diet') OR TITLE-ABS-KEY ('pescovegetarian AND diet') OR TITLE-ABS-KEY ('dash AND diet') OR TITLE-ABS-KEY ('diet AND therapy') OR TITLE-ABS-KEY ('western AND diet') OR TITLE-ABS-KEY ('western

AND dietary AND pattern') OR TITLE-ABS-KEY ('healthy AND diet') OR TITLE-ABS-KEY ('healthy AND diet AND indicator') OR TITLE-ABS-KEY ('healthy AND diet AND score') OR TITLE-ABS-KEY ('healthy AND dietary AND pattern') OR TITLE-ABS-KEY ('healthy AND eating AND index') OR TITLE-ABS-KEY ('healthy AND eating AND index AND 2015') OR TITLE-ABS-KEY ('healthy AND eating AND index AND 2010') OR TITLE-ABS-KEY (healthy AND eating AND index 2005) OR TITLE-ABS-KEY ('prudent AND diet') OR TITLE-ABS-KEY ('prudent AND dietary AND pattern'))

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Early-Onset [Supplementary Concept]"))

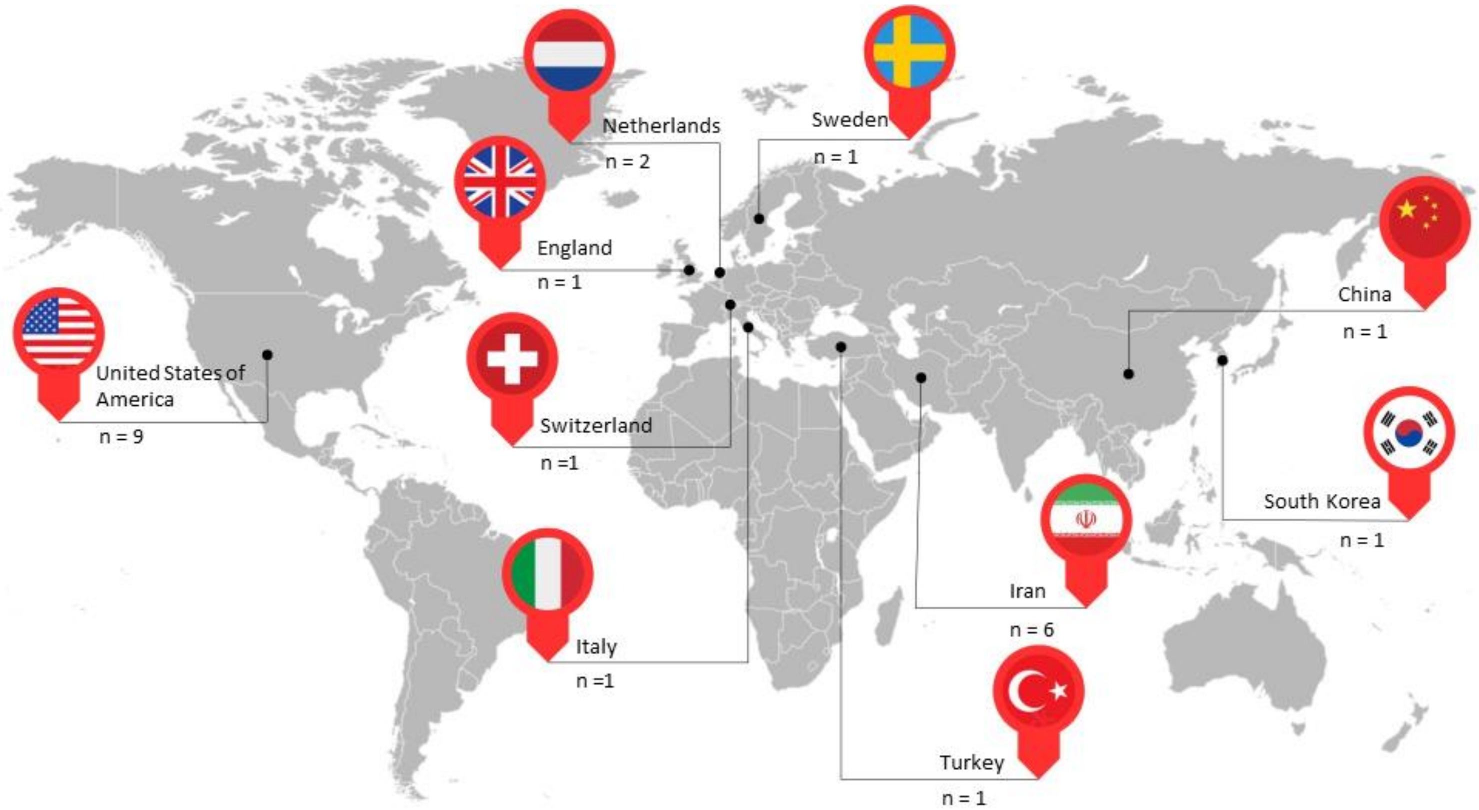

Figure S1. Frequency of studies on dietary patterns and COPD risk/ presence or clinical outcomes in diagnosed patients by country.

Confounders adjusted		Ardestani, 2017 (6)	Arslan, 2023 (1)	Brigham, 2018 (2)	Chen, 2022 (13)	Dinparast, 2021 (19)	Ducharme-Smith, 2021 (9)	Fischer, 2019 (10)	Ghosn, 2023 (11)	Jackson, 2023 (8)	Liu, 2021 (21)	Maisonneuve, 2016 (22)	Malmir, 2021 (23)	McKeever, 2010 (3)	Paknahad, 2020 (24)	Shaheen, 2010 (12)	Shin, 20(4)	Steinemann, 2018 (14)	Varraso, 2007 (7)	Varraso, 2015 (15)	Varraso, 2023 (18)	Voortman, 2017 (16)	Wen, 2023 (20)	Yazdanpanah, 2016	Yu, 20222(5)
Biological	Age	■		■	■	■	■		■		■		■	■		■	■	■	■	■		■			
	Sex	■		■	■	■	■		■	■	■		■	■				■				■	■		■
	Race/Ethnicity			■			■			■	■								■	■	■				
	Height						■			■				■		■		■							
Dietary	Energy intake	■		■			■		■	■		■	■			■	■	■	■	■	■	■			■
	Multivitamins use																		■						■
	Processed meat consumption	■											■							■					
Risk factors	Smoking status	■		■		■	■		■																
	Pack/years	■		■	■			■						■		■		■	■	■	■		■		
	Passive smoking																■		■		■				■
	Pollutants exposure	■			■						■						■								■
	Geographic origin									■									■	■	■				
LS	Physical activity	■		■	■			■																	
	Alcohol consumption															■									■
SES-related	Health follow-up																		■		■				
	Marital status								■									■							■
	Socioeconomic level	■			■		■		■	■	■					■				■		■			
	Education level	■		■		■	■	■	■		■		■	■		■		■			■	■	■		■
Clinical	Medication					■										■									
	Asthma history				■																				■
	C-Reactive Protein										■						■								
	Body mass index			■		■	■		■	■	■			■			■	■	■		■			■	■
*	Cohort of origin													■								■			

Figure S2. Variables included as confounders in the multivariate analysis performed by studies.

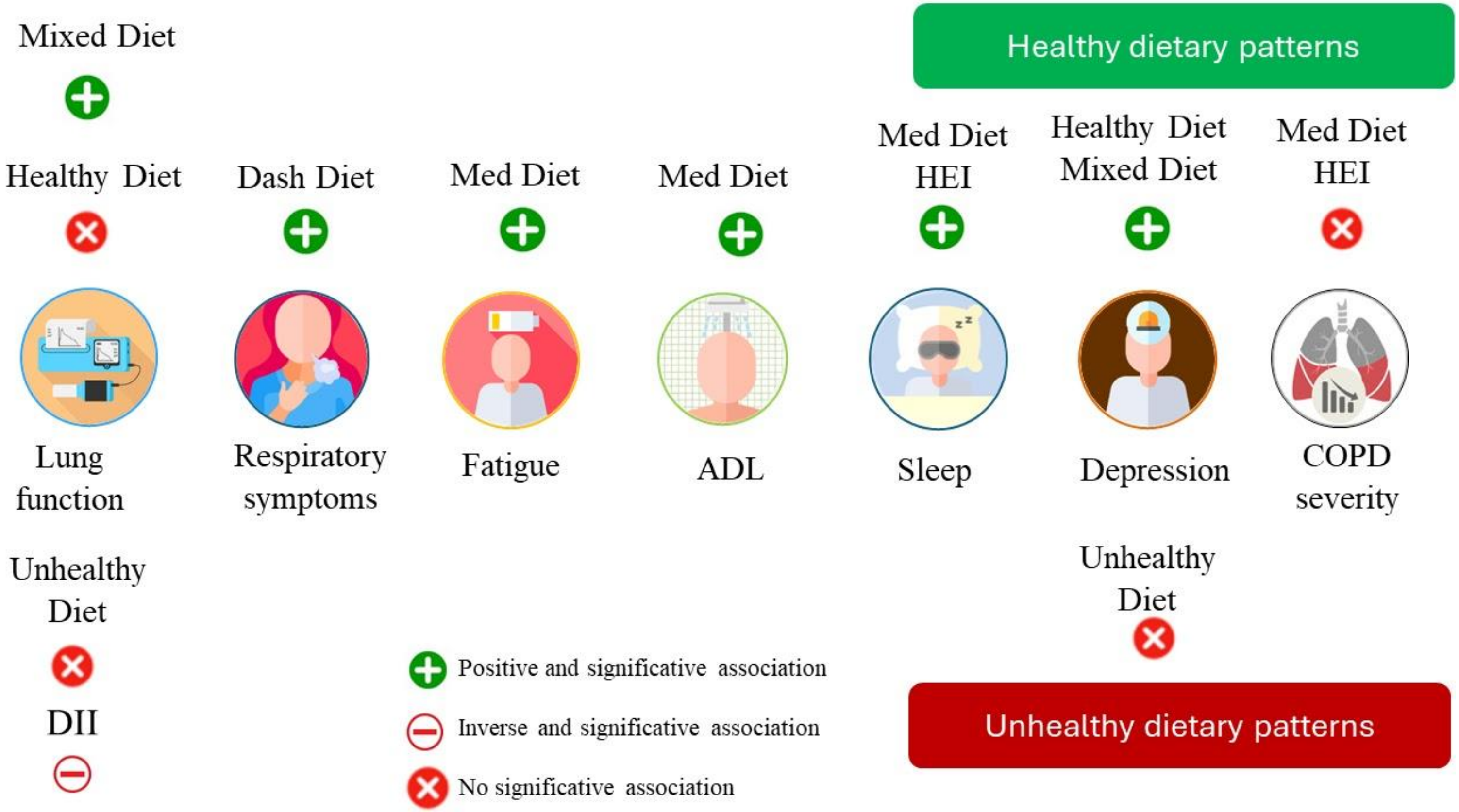

Figure S3. Association of healthy and unhealthy dietary patterns and clinical outcomes in COPD patients.

Abbreviations: ADL: Activities of Daily Living; COPD: Chronic Obstructive Pulmonary Disease; Dash Diet: Dietary Approaches to Stop Hypertension Diet; DII: Dietary Inflammatory Index; Med Diet: Mediterranean Diet; HEI: Healthy Eating Index.

Table S1. References of excluded studies during the full-text examination phase with reasons (n = 24).

Reference	Reason for exclusion
1. Hanson C, Sayles H, Rutten EEPA, Wouters EFM, MacNee W, Calverley P, Meza JL, Rennard S. The Association Between Dietary Intake and Phenotypical Characteristics of COPD in the ECLIPSE Cohort. Chronic Obstr Pulm Dis. 2014;1(1):115-124. doi: 10.15326/jcopdf.1.1.2014.0113	Does not assess dietary patterns.
2. G. Tumer Et Al. , "The Effects of a High-Fat, Low-Carbohydrate Diet on the Prognosis of Patients with an Acute Attack of Chronic Obstructive Pulmonary Disease," TURKIYE KLINIKLERI TIP BILIMLERI DERGISI , vol.29, no.4, pp.895-904, 2009	It is not an observational study.
3. Møgelberg N, Tobberup R, Møller G, Godtfredsen NS, Nørgaard A, Andersen JR. High-protein diet during pulmonary rehabilitation in patients with chronic obstructive pulmonary disease. Dan Med J. 2022;69(11):A03220185. PMID: 36331152.	It is not an observational study.
4. Baldrick FR, Elborn JS, Woodside JV, Treacy K, Bradley JM, Patterson CC, Schock BC, Ennis M, Young IS, McKinley MC. Effect of fruit and vegetable intake on oxidative stress and inflammation in COPD: a randomised controlled trial. Eur Respir J. 2012;39(6):1377-84. doi: 10.1183/09031936.00086011.	It is not an observational study.
5. Angelillo VA, Bedi S, Durfee D, Dahl J, Patterson AJ, O'Donohue WJ Jr. Effects of low and high carbohydrate feedings in ambulatory patients with chronic obstructive pulmonary disease and chronic hypercapnia. Ann Intern Med. 1985;103(6 (Pt 1)):883-5. doi: 10.7326/0003-4819-103-6-883.	It is not an observational study.

6. Kuo CD, Shiao GM, Lee JD. The effects of high-fat and high-carbohydrate diet loads on gas exchange and ventilation in COPD patients and normal subjects. Chest. 1993;104(1):189-96. doi: 10.1378/chest.104.1.189.	It is not an observational study.
7. Kerley CP. The Western Diet: A Smoking Gun for Chronic Obstructive Pulmonary Disease and Asthma? Ann Am Thorac Soc. 2018;15(10):1240. doi: 10.1513/AnnalsATS.201806-404LE. PMID: 30016124	It is not an observational study.
8. Mekary RA. A higher overall diet quality is inversely associated with the risk of chronic obstructive pulmonary disease (COPD) in men and women. Evid Based Med. 2016;21(1):36. doi: 10.1136/ebmed-2015-110193.	It is not an observational study.
9. Goldstein SA, Askanzi J. Exercise, diet, and the rehabilitation of lung patients. Curr Concepts Nutr. 1986;15:183-201. PMID: 3533438.	It is not an observational study.
10. Jacobs DR Jr, Kalhan R. Healthy Diets and Lung Health. Connecting the Dots. Ann Am Thorac Soc. 2016;13(5):588-90. doi: 10.1513/AnnalsATS.201601-067ED.	It is not an observational study.
11. Keranis E, Makris D, Rodopoulou P, Martinou H, Papamakarios G, Daniil Z, Zintzaras E, Gourgoulianis KI. Impact of dietary shift to higher-antioxidant foods in COPD: a randomised trial. Eur Respir J. 2010;36(4):774-80. doi: 10.1183/09031936.00113809.	It is not an observational study.
12. Young RP, Hopkins RJ. Is the "Western Diet" a New Smoking Gun for Chronic Obstructive Pulmonary Disease? Ann Am Thorac Soc. 2018 Jun;15(6):662-663. doi: 10.1513/AnnalsATS.201802-131ED.	It is not an observational study.
13. Varraso R, Shaheen SO. Could a healthy diet attenuate COPD risk in smokers? Thorax. 2017;72(6):491-492. doi: 10.1136/thoraxjnl-2016-209608.	It is not an observational study.
14. Bakolis I, Hooper R, Bachert C, Lange B, Haahtela T, Keil T, Hofmaier S, Fokkens W, Rymarczyk B, Janson C, Burney PG, Garcia-Larsen V. Dietary patterns and respiratory health in adults from nine European countries-Evidence from the GA2 LEN study. Clin Exp Allergy. 2018;48(11):1474-1482. doi: 10.1111/cea.13243.	Does not involve COPD diagnosed individuals or assess COPD as an outcome
15. Butler LM, Koh WP, Lee HP, Tseng M, Yu MC, London SJ; Singapore Chinese Health Study. Prospective study of dietary patterns and persistent cough with phlegm among Chinese Singaporeans. Am J Respir Crit Care Med. 2006;173(3):264-70. doi: 10.1164/rccm.200506-901OC.	Does not involve COPD diagnosed individuals or assess COPD as an outcome

16. Root MM, Houser SM, Anderson JJ, Dawson HR. Healthy Eating Index 2005 and selected macronutrients are correlated with improved lung function in humans. Nutr Res. 2014;34(4):277-84. doi: 10.1016/j.nutres.2014.02.008	Does not involve COPD diagnosed individuals or assess COPD as an outcome
17. Shivappa N, Blair CK, Prizment AE, Jacobs DR Jr, Steck SE, Hébert JR. Association between inflammatory potential of diet and mortality in the Iowa Women's Health study. Eur J Nutr. 2016;55(4):1491-502. doi: 10.1007/s00394-015-0967-1	Does not involve COPD diagnosed individuals or assess COPD as an outcome
18. Cho Y, Chung HK, Kim SS, Shin MJ. Dietary patterns and pulmonary function in Korean women: findings from the Korea National Health and Nutrition Examination Survey 2007-2011. Food Chem Toxicol. 2014;74:177-83. doi: 10.1016/j.fct.2014.09.014.	Does not involve COPD diagnosed individuals or assess COPD as an outcome
19. Catalin RE, Martin-Lujan F, Salamanca-Gonzalez P, Palleja-Millan M, Villalobos F, Santigosa-Ayala A, et al. Mediterranean Diet and Lung Function in Adults Current Smokers: A Cross-Sectional Analysis in the MEDISTAR Project. Nutrients [Internet]. 2023 Mar 3;15(5):1272. Available from: https://www.mdpi.com/2072-6643/15/5/1272	Does not involve COPD diagnosed individuals or assess COPD as an outcome
20. Gutiérrez-Carrasquilla L, Sánchez E, Hernández M, Polanco D, Salas-Salvadó J, Betriu À, et al. Effects of Mediterranean Diet and Physical Activity on Pulmonary Function: A Cross-Sectional Analysis in the ILERVAS Project. Nutrients. 2019;11(2):329. Available from: http://www.mdpi.com/2072-6643/11/2/329	Does not involve COPD diagnosed individuals or assess COPD as an outcome
21. Han YY, Jerschow E, Forno E, Hua S, Mossavar-Rahmani Y, Perreira KM, et al. Dietary Patterns, Asthma, and Lung Function in the Hispanic Community Health Study/Study of Latinos. Ann Am Thorac Soc. 2020;17(3):293–301. Available from: https://www.atsjournals.org/doi/10.1513/AnnalsATS.201908-629OC	Does not involve COPD diagnosed individuals or assess COPD as an outcome
22. Saussereau J, Guillien A, Soumagne T, Laplante JJ, Laurent L, Bouhaddi M, et al. Dietary Patterns and Prevalence of Post-bronchodilator Airway Obstruction in Dairy Farmers Exposed to Organic Dusts. COPD J Chronic Obstr Pulm Dis. 2019;16(2):118–25. Available from: https://www.tandfonline.com/doi/full/10.1080/15412555.2019.1631775	Does not involve COPD diagnosed individuals or assess COPD as an outcome
23. Sorli-Aguilar M, Martin-Lujan F, Flores-Mateo G, Arija-Val V, Basora-Gallisa J, Sola-Alberich R. Dietary	Does not involve COPD diagnosed

	patterns are associated with lung function among Spanish smokers without respiratory disease. BMC Pulm Med. 2016;16(1):162. doi:10.1186/s12890-016-0326-x	individuals or assess COPD as an outcome
24.	Wharton R, Wang JG, Choi Y, Eisenberg E, Jackson MK, Hanson C, Liu B, Washko GR, Kalhan R, Jacobs DR, Bose S. Associations of a Plant-centered Diet and Lung Function Decline across Early to Mid-Adulthood: The CARDIA Lung Study. Res Sq [Preprint]. 2023 Apr 26:rs.3.rs-2845326. doi: 10.21203/rs.3.rs-2845326/v1	Preprint

Table S2. Summary of Dietary Patterns' characteristics and its analytical approaches in the included studies, according to the approach of assessment adopted.

Reference	Dietary pattern (s) characteristics and scoring	Categorization for data analysis
"A priori" approach for dietary pattern assessment		
Ardestani, 2017 (22)	DASH score (Healthy): Total components number= 8. pre-fixed values ● The first five food items (whole grains, fruits, vegetables, low-fat dairy products, and legumes and nuts) scored according to intake quartiles 1, 2, 3, and 4 in 1, 2, 3, and 4 points, respectively. In contrast, the last three food items (red meat/processed meats, SSB, and salt score) scored according to intake quartiles 1, 2, 3, and 4 in 4, 3, 2, and 1 points, respectively. ● Modification: dietary salt served as a proxy for assessing dietary sodium intake. ● Unequal weighting for each component. TOTAL SCORE: 8–32.	Tertile of DASH diet adherence
Arslan, 2023 (23)	MEDAS (Healthy): Total components = 14 questions. pre-fixed values and dichotomous scoring ● Each question scored as "1" or "0", according to the amount of consumption related to adherence to Mediterranean-type eating habits. ● Modification: not reported. ● Equal weighting for each question. TOTAL SCORE: 0–14. ● Adherence categories: Acceptable (7 or 8 points) and High (≥ 9 points).	Low, medium, and high adherence to MEDAS
Chen, 2022 (25)	DII (Unhealthy): Total = 26 food parameters ● Based on the following food parameters: alcohol, energy, carbohydrates, proteins, fats, fiber, cholesterol, SFA, MUFA, PUFA, niacin, vitamins (A, B1, B2, B6, B12, C, D and E), iron, magnesium, zinc, selenium, folic acid, β carotene and caffeine associated with inflammatory biomarkers (identified by a review including 1,943 articles published from 1950 to 2010), each parameter scored according to its pro or anti-inflammatory effects and weighted according to study design. ● Modification: exclusion of 19 food parameters as they were unavailable in the NHANES 2007-2012. ● Unequal weighting for each component. TOTAL SCORE: not reported.	Quartile of DII score

	● High DII score (indicates a pro-inflammatory diet).	
Ducharme-Smith, 2021 (27)	<u>AHEI-2010</u> (Healthy): Total components number= 11. pre-fixed values ● Each component scored from 0 to 10 (worst to best. Scores increase: ∇ fruit, vegetables, whole grains, nuts and legumes, w-3 fats, PUFA and moderate consumption of alcohol. Scores decrease: ∇ SSB, red/processed meat, TFA, sodium and heavy consumption of alcohol). ● Modification: not reported. ● Unequal weighting for each component. ● TOTAL SCORE: 0–110. The diet quality is proportional to the total score.	Quartile of AHEI-2010 score
Fischer, 2019 (28)	<u>modified MDS</u> (Healthy): Total components number= 8. pre-fixed values and dichotomous scoring ● MUFA/PUFA to SFA ratio, vegetables and potatoes, fruit, wholegrain cereals, fish, meat and meat products, and dairy products scoring 1 point each, if intake > **MEDIAN VALUE (GENDER-SPECIFIC)** and if intake < median value (gender-specific) for meat and meat and dairy products, and alcohol intake of 5–25 g/d (women) and 10–50 g/d (men). ● Modification: not reported. ● Equal weighting for each component. TOTAL SCORE: 0–8. ● Adherence categories: Low (0–2 points), medium (3–5 points), and high (6–8 points).	Low, medium, and high adherence to MDS score
Ghosn, 2023 (29)	<u>HEI-2010</u> (Healthy): Total components number= 12. pre-fixed values ● Healthy food groups (fruits, whole grains, vegetables, nuts and legumes, and long chain w-3 fats and PUFAS) scored based on deciles of intake, with the highest score (10) assigned to the highest **DECILE** and the lowest score (0) assigned to the lowest decile category of these food groups. Conversely, unhealthy food groups (red and processed meat, SSB, fruit juice, sodium, TFA, SFA and added sugars), received inverted scoring. Participants in deciles 9 to 2 (counting downwards) received scores of 2 to 9 (counting upwards), respectively, for this group. ● Modification: there was no evaluation regarding alcohol intake data. ● Unequal weighting for each component. TOTAL SCORE: 0–120. ● Zero indicating an unhealthy diet and 120 indicating a healthy diet.	Quartile of HEI-2010 score
Jackson, 2023 (30)	<u>APDQS</u> (Healthy): Total components number= 46. ● Plant-based foods with the highest nutritional value (fruits, avocado, green and yellow vegetables, and whole grains) contribute to higher scores, while nutritionally poor plant-based foods (fried potatoes, grain desserts,	Quintile of ADQS score

	margarine, and fruit juice) result in lower scores. The assessment also takes into account the quality of animal products. ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 0–132. ● The diet quality is proportional to the total score.	
Liu, 2021 (31)	DII (Unhealthy): Total components number= 27 ● Nutrients evaluated: alcohol, vitamin B12/B6, β-carotene, caffeine, carbohydrates, cholesterol, energy, total fat, fiber, folic acid, iron, magnesium, MUFA, niacin, n-3 fatty acids, protein, PUFAs, riboflavin, saturated fat, selenium, thiamine, vitamin A/C/D/E, and zinc. ● The DII calculation involved three steps: 1º) Z-score obtention by calculating the DII based on dietary intake data and linking it to a regionally representative world database. It provides estimated mean and standard deviation values for each parameter used as multipliers to express an individual's exposure relative to the standard global mean as a **Z-score**. The Z-score is calculated by subtracting the global daily mean intake, dividing by its standard deviation, converting the value to a **percentile** score, and then doubling it and subtracting "1" to achieve a symmetrical distribution; 2º) The centered percentile value for each food parameter is multiplied by the corresponding overall food parameter-specific inflammatory effect score to obtain the food parameter-specific DII score. 3º) Summing each food parameter-specific DII score to achieve an individual overall DII score. ● Modification: numbers of nutrients applied for the calculation of DII is < 30. ● Unequal weighting for each component. TOTAL SCORE: Not reported.	Tertile of DII score
Maisonneuve, 2016 (32)	DII (Unhealthy): Total = 24 food parameters ● Based on the following food parameters: carbohydrate, protein, fat, alcohol, fiber, cholesterol, SFA, MUFA, PUFA, w-3 and w-6 fats, riboflavin, iron, zinc, vitamins B12, B6, niacin, thiamin A, C, D, E, folic acid, and beta carotene. The system scoring involved linking dietary data to a global database, as determined by the literature review, to calculate **Z-SCORES**, which were then converted to centered percentile scores to address skewness. These scores were multiplied by literature-derived inflammatory effect scores for each food parameter and summed to generate each subject's overall DII score. ● Modification: exclusion 21food parameters as they could not be measured with the FFQ used at the COSMOS study. ● Unequal weighting for each component.TOTAL SCORE: not reported.	Quartile of AMDS score and DII score

	aMED (Healthy): Total components number= 9. pre-fixed values and dichotomous scoring ● For vegetables, fruits, nuts, cereals, legumes, and fish, intakes > of **SAMPLE MEDIAN VALUE** received 1 point; otherwise, received 0 points. For red and processed meat consumption, intakes < of sample median value received 1 point. Moderate alcohol intake received 1 point. ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 0-9. ● Total scores are proportional to MedDiet **ADHERENCE**.	
Malmir, 2021 (33)	LCD (Healthy): pre-fixed values ● Scoring based on **DECILES** of intake for fat, protein and carbohydrate intakes, expressed as % TE. For fat and protein, highest intake received 10 points and lowest intake received 1 point. For carbohydrates the scoring pattern was reversed. ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 3–30. ● A total score of 3 indicates the lowest fat and protein intake and the highest carbohydrate intake, while a score of 30 reflects the highest protein and fat intake and the lowest carbohydrate intake.	Quintile of carbohydrate inake
Paknahad, 2020 (35)	HEI-2005 (Healthy): Total components number= 12. pre-fixed values ● The first six components (total grains, whole grains, vegetables; dark-green and orange vegetables, legumes, fruit, and whole fruit) score 0 to 5 points each; the next five (milk, meats and beans, oils; SFA, and sodium) score 0 to 10 points each; and the last (calories from solid fat, alcohol and added sugar) scores 0 to 20 points. Scores are distributed evenly except for saturated fat and sodium; these components are assessed with 0 to 8 and 8 to 10 points (with 8 and 10 points being the acceptable and optimal levels, respectively). ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 0–100. ● Diet total score categories: Inadequate (<51), requiring modifications (51-80), and healthy (>80). HEI-2010 (Healthy): Total components number= 12. ● It includes nine adequacy and three moderation components. The standard is set by using **DENSITY APPROACH OR THE PERCENTAGE OF CALORIES**. HEI-2010 emphasizes the food quality and introduces seafood and plant proteins. ● Modification: not reported. ● Unequal weighting for each component.	MED and HEI scores as a continuous variable

	<u>MED score</u> (Healthy): pre-fixed values and dichotomous ● The score includes the following items: vegetables, legumes, fruits, nuts, dairy, cereals, meat and meat products, fish, MUFA: SFA ratio, red-to-white meat ratio, whole grain, and refined grain. Intake for healthy components < median scores 0 and > median scores 1. Intake for detrimental components < or > median scores of 1 or 0, respectively. ● Modifications: Nuts and fruit were categorized separately, whole grain and refined grain were categorized into two groups, and the alcohol component was omitted. A negative point was assigned for the red to white meat ratio. ● Unequal weighting for each component. TOTAL SCORE: 0–10. ● The score is proportional to MedDiet **ADHERENCE.**	
Varraso, 2015 (40)	<u>AHEI 2010</u> (Healthy): Total components number= 11. **PRE-FIXED VALUES** ● For the first six components [vegetables, fruit, whole grains, nuts and legumes, long chain w-3 fats (DHA and EPA, and PUFA)], the ideal constitutes higher intake; for alcohol, the ideal constitutes moderate intake; and for four components (SSB and fruit juice, red and processed meat, TFA, and sodium) the ideal constitutes avoidance or lowest. Each component receives a minimal (0) and a maximal score (10), with intermediate values scored proportionally and potentially contributing 0–10 points to the total score. ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 0–110. ● Higher scores indicate healthier diet.	Quintile of AHEI-2010 score
Varraso, 2023 (41)	<u>hPDI</u> (Healthy): Total components number= 18. ● Healthful groups (whole grains, fruits, vegetables, nuts, legumes, vegetable oils, and tea & coffee). <u>uPDI</u> (Unhealthy): Total components number= 18. ● Unhealthful groups (fruit juices, refined grains, potatoes, sugar sweetened, and sweets and desserts). ● The proposed plant-based food groups for each dietary pattern were ranked into consumption **QUINTILES** and given positive or reverse scores: Positive (> highest quintile the healthful food group = score 5 and < lowest quintile = score 1); Reverse (the previous scoring pattern was reversed). ● Animal food groups (animal fat, dairy, egg, fish or seafood meat, and miscellaneous animal-based foods) received reverse scores in both the hPDI and uPDI, indicating its lower intake. Total fiber, adjusted for **TE** using the residual method, was considered a continuous variable.	Quintile of PDI score

	● Processed meat consumption was categorised into three groups: never/almost never, <1 serving/week, and ≥1 serving/week. ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 18–90. ● Higher scores in hPDI and uPDDI indicate healthier poorer dietary quality, respectively	
Voortman, 2017 (42)	DDG-2015 (Healthy): Total components number= 14. **PRE-FIXED VALUES AND DICHOTOMOUS** ● Assess the adherence to the following dietary recommendations: vegetables (≥200 g/d), fruit (≥200 g/d), whole-grains (≥90 g/d), legumes (≥135 g/wk), nuts (≥15 g/d), dairy (≥350 g/d), fish (≥100 g/wk), tea (≥450 mL/d), whole-grains: total grains ratio (≥50%), unsaturated fats and oils: total fats ratio (≥50%), red and processed meat (<300 g/wk), sugar-containing beverages (≤150 mL/d), alcohol (≤10 g/d) and salt (≤6 g/d). Scoring 1 for each, if the recommendation is met. Otherwise, scoring 0. ● Modification: not reported. ● Equal weighting for each component. TOTAL SCORE: 0–14. ● The total score is proportional to the adherence to DDG-2015.	Quintile of DDG-2015 adherence
Wen, 2023 (43)	DASH diet score (Healthy): Total components number= 9. **PRE-FIXED VALUES AND DICHOTOMOUS** ● The scores considered the following target nutrients (SFA, total fat, protein, cholesterol, fiber, magnesium, calcium, potassium, and sodium). The following parenthesis presents the target (score 1) and intermediate goal (score 0.5), respectively adjusted to the % TE for each nutrient: (SFA 6% and 11%), total fat (27% and 32%), and protein (18% and 16.5%). For the other nutrients, the target (score 1) and intermediate goal (score 0.5), respectively, are presented in the parenthesis according to their ratio per 1,000 kcal: cholesterol (71.4 mg and 107.1 mg), fiber (14.8 g and 9.5 g), magnesium (238 mg and 158 mg), calcium (590 mg and 402 mg), potassium (2,238 mg and 1,534 mg), and sodium (1,143 mg and 1,286 mg). ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 4.5–9. ● The score proportionally rose with increased intake of protein, fiber, magnesium, calcium, or potassium and declined with decreased intake of saturated fat, total fat, cholesterol, or sodium. Modified MDI (Healthy): Total components number= 9. **PRE-FIXED VALUES**	Tertile of adherence to DASH and MDI scores

	● It includes the following food categories: fruits, vegetables, legumes, cereals, fish, dairy, olive oil, meat, and alcohol. ● The daily food amount (in parenthesis) represents the target (2 points) and intermediate target (1 point) consumption levels for each food group, respectively, for legumes (140 g and 70 g), cereals (195 g and 130 g), fish (250 g and 100 g), dairy (270 g and 180 g), meat (80 g and 120 g), and alcohol (12 g and 24 g). For fruits, the scoring reflected < 1 CE as 0, ≥ 1 CE as 1, and ≥ 2 CE as 2. For vegetables, <0.5 CE was scored as 0, ≥ 0.5 CE as 1, and ≥ 1 CE as 2. For olive oil, intake scored <14 g as 0, ≥ 14 g as 1, and ≥ 28 g as 2. ● Modifications: adjustments to fruit and vegetable intake scoring, where intake levels were categorised based on cup equivalents (CE). Additionally, olive oil intake scoring was based on grams consumed. ● Unequal weighting for each component. TOTAL SCORE: 0–18. ● Higher scores indicate better compliance with the MedDiet.	
Yazdanpanah, 2016 (44)	HEI-2005 (Healthy): Total components= 12. proportional scoring based on consumption levels and density adjustments ● The scoring system evaluates adequacy (total fruit, whole fruit, total, dark green and orange vegetables and legumes, total grains, meat and beans) and moderation (SFA, sodium, and calories from SoFAAS) of de diet. ● The quantity indicated within parentheses according to their ratio per **1,000 kcal** scores 5 points: total fruit [≥0.8 cup equivalents (CE)], whole fruit (≥0.4 CE), total vegetables (≥1.1 CE), dark-green and orange vegetables, and legumes (≥0.4 CE), total grains [≥3 ounces equivalent (oz eq.)], and whole grains (≥1.5 oz eq.)] and 10 points [milk (≥1.3 CE), meats and beans (≥2.5 oz eq.), and oils (≥12 g)]. While the absence of the component in the diet scores 0 points. ● The scoring for maximum (10) and minimum (0) scores is respectively presented in parentheses as follows: SFA (≤7% TE and ≥15% TE) and sodium (≤0.7 g/1000 kcal and ≥2.0 g/1000 kcal). And the scoring for maximum (20) and minimum (0) scores is respectively presented in parentheses as follows: SoFAAS (≤20% TE and ≥50% TE). ● Modification: not reported. ● Unequal weighting for each component. TOTAL SCORE: 0–100.	HEI-2005, HEI-2010 and MDS as a continuous variable.

- It assesses **ADHERENCE** to dietary guidelines.
- Diet total score categories: Inadequate (<51), requiring modifications (51-80), and healthy (>80).

HEI-2010 (Healthy): Total components= 12. proportional scoring based on consumption levels and density adjustments

- The scoring system evaluates adequacy (total fruit, whole fruit, total vegetables, green and peas, whole grains, dairy, total protein foods, seafood and plant proteins, and PUFA + MUFA: SFA ratio) and moderation (refined grains, sodium, and empty calories).
- The scoring for total fruit, whole fruit, and total vegetables follows the same pattern as in the HEI-2005.
- The quantity indicated within parentheses according to their ratio per 1,000 kcal scores 10 points [whole grains (≥1.5 ounces equivalent (oz eq.)] and dairy (≥1.3 cup equivalents). While the absence of the component in the diet scores 0 points. The quantity indicated within parentheses according to their ratio per 1,000 kcal scores 5 points [total protein foods (≥2.5 oz eq.) and seafood and plant proteins (≥0.8 oz eq.). While the absence of the component in the diet scores 0 points. The scoring for maximum (10) and minimum (0) scores for Fatty Acids is (PUFAs + MUFAs)/SFAs >2.5 and (PUFAs + MUFAs)/SFAs <1.2, respectively. For Moderation: Refined Grains, the scores are (≤1.8 oz eq.) and (≥4.3 oz eq.), while for sodium, it's (≤1.1 g) and (≥2.0 g). The scoring for maximum (20) and minimum (0) scores for empty calories is (≤19% TE) and (≥50% TE), respectively.
- Modification: not reported.
- Unequal weighting for each component. TOTAL SCORE and its categorization follows the same pattern as in the HEI-2005.

Modified MDS (Healthy): Total components= 10. **PRE-FIXED VALUES AND DICHOTOMOUS**

- For fish, fruits, legumes, nuts, PUFA: SFA ratio, vegetables, and whole grains intake ≥ **MEDIAN**, scores 1, otherwise 0. For refined grains, dairy products, and red and processed meats: white meat ratio intake < median, scores 1, otherwise 0.

	• Modifications: included separating nuts and fruit components, deleting the alcohol component, assigning a negative point to the ratio of red meat to white meat, categorizing whole grain and refined grain, replacing MUFA intake with PUFA intake, and adjusting the scoring system. • Equal weighting for each component. TOTAL SCORE: 0–10. • The scores are proportional to MedDiet **ADHERENCE**.	
"A POSTERIORI" approach for dietary pattern assessment		
Brigham, 2018 (24)	Multivariate statistical method applied: (29 food groups) The categorization was based on nutrient composition similarity into 29 subgroups, and then organized into five major food groups: meat, dairy, fruits and vegetables, refined grains, and whole grains and analysed by the. principal component analysis. Prudent (Healthy): ∇ vegetables, fruit, fish, poultry, and whole grains. Westernized (Unhealthy): ∇ refined grains, red and processed meats, French fries, eggs, and soda.	Quintile of Prudent and Westernized Diet adherence
Dinparast, 2021 (26)	Multivariate statistical method applied: Factor analysis (40 food groups). Healthy (Healthy): fruits, yellow vegetables, garlic, tomatoes, other vegetables, poultry, doogh, grains, nuts, potatoes, low-fat dairy products. Mixed: dressings, dried fruit, mayonnaise, SFA, whole grains, red meat and cruciferous vegetables. Unhealthy: pastries, pickles, drinks, processed meats, snacks, coffee, offal, pizza, butter, refined cereals and high fat dairy .	Healthy, Mixed and Unhealthy diet scores as a continuous variable
McKeever, 2010 (34) .	Multivariate statistical method applied: Principal component analysis (46 food groups). Traditional (Unhealthy): ∇ red meat, processed meat, potato, boiled vegetables, added fat, coffee, and beer and © soy products, low-fat dairy products, tea, breakfast cereal, brown rice, pizza, juice, and fruit	Quintiles of adherence to Traditional, Cosmopolitan

	Cosmopolitan (Healthy): ∇ vegetables, fish, chicken, wine, rice and © high-fat dairy products, added fat, added sugar, and potato. Refined-foods (Unhealthy): ∇ mayonnaise, salty snacks, candy, high-sugar beverages, French fries, white bread, and pizza and © boiled vegetables, whole grain bread, fruit, and cheese	and Refined-foods diets
Shaheen, 2010 (36)	Multivariate statistical method applied: Principal component analysis [51 food groups (wk frequencies)]. Prudent (Healthy): ∇ fruit, vegetables, oily fish and wholemeal cereals and © white bread, added sugar, full-fat dairy products, chips and processed meat. Traditional (Unhealthy): ∇ vegetables, processed meat, offal, fish, red meat and puddings and © milky drinks, reduced fat spread and breakfast cereals.	Quintile of adherence to Prudent and Traditional diets
Shin, 2021 (37)	Multivariate statistical method applied: Principal component analysis (27 food groups). Coffee, fat, and sweet (Unhealthy): ∇ sweets, oils and fats, and coffee and © vegetable. Prudent (Healthy): ∇ potatoes, starch jelly, legumes, vegetables, kimchi, mushrooms, fruits, meat, fish and shellfish, seaweeds, soup, and other beverages. Westernized (Unhealthy): ∇ noodles and dumplings, cereals and snacks, bread, pizza, hamburger, starch jelly, nuts, fruits, meat, eggs, fish and shellfish, dairy products, and seasoning White rice (Unhealthy): ∇ white rice and © whole grains.	Quartile of adherence to the dietary patterns
Steinemann, 2018 (38)	Multivariate statistical method applied: Principal component factor analysis [25 food groups (g food/kg body weight/d).	Dietary patterns scores

	Prudent (Healthy): ∇ vegetables, fruits, water, tea and coffee, fish, and nuts. Traditional Western (Unhealthy): ∇ meat, sausage, egg, fish, and alcohol. High-carbohydrate (Unhealthy): ∇ sweet spreads, bread, dessert, and potatoes.	as continuous variable
Varraso, 2007 (39)	Multivariate statistical method applied: Principal component analysis [40 food groups (1986) and 42 food groups (1990 and 1994)] Prudent (Healthy): ∇ fruits, vegetables, fish and whole grain products. Westernized (Unhealthy): ∇ refined grains, cured and red meats, desserts and French fries.	Quintile of adherence to prudent and westernized diets.
Yu, 2022 (45)	Multivariate statistical method applied: Principal component analysis [12 food groups (d/wk) and nine drinks (g/wk)]. Traditional northern: ∇ wheat and other staple foods (corn, millet, etc.) and © rice. Balanced: ∇ fresh fruit and protein-rich foods (soybean, meat, poultry, fish, eggs, and dairy products).	Quintile of adherence to traditional northern and balanced

Table S3. Methodological quality of cohort studies included in the current scoping review according to Newcastle-Ottawa Scale.

Cohort studies (using Newcastle-Ottawa Scale)									
Categories	Item No.	Quality assessment criteria	29	43	28	36	39	16	26
Selection (4)	1	Representativeness of the exposed cohort	★	★			★	★	★
	2	Selection of the non-exposed cohort			★	★	★	★	★
	3	Ascertainment of exposure	★						
	4	Demonstration that outcome of interest was not present at start of study	★	★	★	★		★	★
Comparability (2)	5	Controlled for confounders smoking and age			★	★	★	★	★
	6	Study controls for any additional factor	★	★	★	★	★	★	★
Outcome (3)	7	Assessment of outcome	★	★	★			★	★
	8	Was follow-up long enough for outcomes to occur	★		★	★	★	★	★
	9	Adequacy of follow up of cohorts	★	★				★	
SCORE			7	5	6	5	5	8	7

Table S4. Methodological quality of case-control studies included in the current scoping review according to Newcastle-Ottawa Scale.

Case-control studies (using Newcastle-Ottawa Scale)						
Categories	Item No.	Quality assessment criteria	27	31	32	44
Selection (4)	1	Is the case definition adequate?	★		★	★
	2	Representativeness of the cases	★	★	★	★
	3	Selection of controls		★		
	4	Definition of controls	★		★	★
Comparability (2)	5	Study controls for smoking and age		★	★	★
	6	Study controls for any additional factor	★	★	★	★
Exposure (3)	7	Ascertainment of exposure				
	8	Same method of ascertainment for cases and controls	★	★	★	★
	9	Non-response rate			★	★
SCORE			5	5	7	7

Table S5. Methodological quality of cross-sectional studies included in the current scoping review according to Newcastle-Ottawa Scale.

Cross-sectional studies (using Newcastle-Ottawa Scale)															
Categories	Item No.	Quality assessment criteria	22	23	34	40	30	42	24	45	33	25	35	41	38
Selection (4)	1	Representativeness of the sample		★	★		★	★		★		★	★	★	★
	2	Sample size justified	★									★	★		
	3	Non-respondents				★	★	★		★		★	★		★
	4	Ascertainment of the exposure (risk factor)		★	★	★	★	★		★	★	★	★	★	★
Comparability (2)	5	The study controls for the most important factor smoking and age		★	★	★	★	★	★	★	★	★	★	★	★
	6	The study control for any additional factor		★	★	★	★	★	★	★	★	★	★	★	★
Outcome (2)	7	Assessment of the outcome		★	★	★	★	★	★		★	★	★	★	★
	8	Statistical test	★	★	★	★	★	★	★	★	★	★	★	★	★
SCORE			2	6	6	6	7	7	4	6	5	8	8	6	7

Figures list

ARTIGO 2

Adherence to the Healthy Eating Index-2020 and clinical outcomes in COPD patients: A cross-sectional study

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ABSTRACT

Background & Aims: Diet quality has been associated with the incidence of chronic obstructive pulmonary disease (COPD) in the general population, with healthy dietary patterns, such as the Mediterranean Diet and the Healthy Eating Index (HEI), showing an inverse association with these outcomes. However, the relationship between healthy dietary patterns and clinical outcomes in patients with COPD remains underexplored. This study aimed to evaluate the association between diet quality (measured using HEI-2020) and clinical outcomes in COPD patients.

Methods: This cross-sectional study included COPD outpatients from two Pulmonary Services in a South Brazilian hospital. COPD diagnosis was confirmed through spirometry and clinical evaluation. The usual diet was assessed using a 3-day food record, and diet quality was evaluated using the HEI-2020 (excluding the "sodium intake" component), with scores ranging from 0 to 90. Patients were categorized into tertiles of HEI-2020 scores: lower, medium, and high. Clinical outcomes assessed included COPD severity, dyspnea intensity, quality of life, functional capacity, disease prognosis, and the exacerbator phenotype. Descriptive statistics, bivariate, and multivariate analyses were performed using SPSS 22.0 and R software.

Results: Ninety-nine patients were included in the study (67.22 ± 8.35 years; 63.6% women; 85.9% self-reported white ethnicity; 86.9% ex-smokers). The most frequent GOLD stages were 3 (34.3%) and 2 (33.3%), and one-third of the sample presented the exacerbator phenotype (34.4%). The mean HEI-2020 score was 56.55 ± 8.43. No significant differences in COPD severity, dyspnea intensity, quality of life, functional capacity, or exacerbator phenotype frequency were observed across tertiles of diet quality. However, patients with a worse prognosis were more frequent ($p = 0.047$) in the first (51.5%) and third (48.5%) tertiles compared to the second tertile (30.3%). This association, however, was not retained in multivariate analysis [OR (second tertile) = 2.29; 95% CI: 0.71–7.38; OR (third tertile) = 0.54; 95% CI: 0.17–1.69].

Conclusion: This sample of COPD outpatients exhibited a relatively low mean HEI-2020 score, suggesting the need for diet quality improvement. However, diet quality was not associated with clinical outcomes in this study.

Keywords: COPD, diet quality, healthy eating index, quality of life, dyspnea, functional capacity, prognosis.

Introduction

Chronic obstructive pulmonary disease is a major public health concern, affecting nearly 384 million people worldwide. Ranking as the third leading cause of death globally, COPD is responsible for over 3 million deaths annually (1,2). This condition is characterized by alveolar abnormalities (emphysema) or airway abnormalities (bronchitis or bronchiolitis), leading to airflow limitation and respiratory symptoms such as cough, dyspnea, and sputum production. Long-term cigarette smoking and exposure to harmful gasses primarily cause COPD, although it can also result from genetic risk factors like alpha antitrypsin deficiency (3).

The impact of specific foods and nutrients on COPD and lung function has been extensively explored in recent decades. Vitamin D, for instance, has anti-inflammatory effects and is associated with improved lung function and reduced COPD exacerbation (4). Polyphenols, found in various plant-based foods, have antioxidant properties that may protect against lung tissue damage (5). High consumption of fruits, vegetables, and omega-3 fatty acids has been linked to protective effects against COPD. In contrast, diets rich in processed foods, sugars, and unhealthy fats may exacerbate the risk and severity of the disease (5,6).

Researchers have recently investigated the association between dietary patterns and lung function or COPD incidence. Healthy patterns, such as Plant-Centered Diet (8), Prudent Diet (9) higher scores on the Alternative Healthy Eating Index (AHEI-2010) (10), Healthful Plant-Based (11), Dutch Dietary Guidelines-2015 adherence (12) and Balanced Diet (13) have been associated with reduced risk of COPD incidence in general populations. On the other hand, higher scores on DII (14), Unhealthful Plant-Based Diet (11), and Westernized Diet (9) have been related to increased COPD incidence. The relationship between these healthy dietary patterns and COPD prevention may be attributed to their high content of fruits, vegetables, whole grains, legumes, nuts, and fish, which provide antioxidants, vitamins, fibers, and unsaturated fats. These foods and nutrients can influence inflammation, oxidative stress, antioxidant depletion, mucus hypersecretion, and alveolar wall destruction (15). All these components are part of dietary indices used to reflect diet quality.

The Healthy Eating Index (HEI) is a measure that includes several food components designed to evaluate the quality of a diet based on dietary recommendations and guidelines (16). It assesses how well an individual's diet aligns with recommended dietary patterns outlined in the Dietary Guidelines for Americans (DGA) (17). These guidelines provide evidence-based nutrition recommendations including consuming a variety of nutrient-dense foods across all food groups such as vegetables, fruits, grains, dairy, and protein foods, while limiting added sugars, saturated fats, and sodium. In 2023 an update of HEI was published to reflect the Dietary Guidelines for Americans, 2020-2025 including a separate HEI-Toddlers-2020 developed for ages 12 through 23 months. The 13 components and scoring standards of the HEI-2020 fully align with the HEI-2015, although the index was renamed to clarify that it aligned with the most recent 2020-2025 DGA. Similarly, the Brazilian Dietary Guidelines (BDG) emphasize the importance of a balanced and diverse diet, rich in natural and minimally processed foods and a limited ultra-processed food intake (18). Thus, the HEI can be used to identify and grade dietary habits and their adherence to recommendations with similar principles advocated in the BDG.

In a recent scoping review conducted by our research group (19), we identified five observational studies evaluating the association between HEI and the incidence of COPD (20-24) (n = 3) or clinical outcomes in patients with diagnosed disease (n = 2). Among the studies involving COPD patients, high values of HEI scores were inversely correlated with the Pittsburgh Sleep Quality Index (PSQI) only in males (22). Considering that the association between diet quality and clinical outcomes in COPD patients has been scarcely explored in the literature, our study aimed to investigate the association between diet quality, measured by the HEI-2020, and clinical outcomes in outpatients with COPD. We hypothesized that COPD patients with higher HEI-2020 scores would exhibit better quality of life, improved lung function, greater functional capacity, and less severe dyspnea compared to those with lower HEI-2020 scores.

Methods

Study design, local and ethical aspects

This cross-sectional study was conducted on patients with COPD consecutively attending the outpatient clinic of a Hospital Complex in South Brazil. The data collection for this study was initiated in January 2019, was interrupted during the COVID-19 pandemic period (March 2020 to March 2022), and finished in July 2024. The study protocol was approved by the Ethics Committee of the Hospital (number 6.690.341) and all patients signed the consent form before the data collection. This study was reported according to the extension of the Strengthening the Reporting of Observational Studies in Epidemiology for Nutrition studies (STROBE-Nut) (25) - the check list is attached as a supplementary material.

Sample size and eligibility criteria

The sample size was calculated based on a study that evaluated the association between dietary patterns and disease severity in a sample of COPD patients (22). Considering the difference between adherence to HEI-2010 among GOLD 1 (59.9 ± 11.6) and GOLD 4 patients (52.7 ± 11.3), a power of 80% and 5% as significance level, the estimated sample size was equal to 80 patients. Adding 20% for confounders adjusting in the multivariate analysis, the number of patients necessary for this study was estimated as 96. OpenEpi program was used (https://www.openepi.com/SampleSize/SSMean.htm)

Patients were prospectively selected based on the following criteria: no dietary counseling by a dietitian during the previous 6 months, over 18 years old, having the diagnosis of COPD confirmed through spirometry performed within the previous 12 months according to the parameters of the Global Initiative for Chronic Obstructive Lung Disease (GOLD). Patients with other pulmonary diseases and those unable to fill in a 3-day dietary record were excluded. We also excluded patients with recorded energy intake out of a 90% confidence interval range of our sample.

Study Protocol

After a pneumologist visit, where the diagnosis of COPD was confirmed and the disease severity was classified, the patients were referred to physiotherapists to undergo the 6-minute walk test and schedule a visit with a registered dietitian. The physiotherapist instructed the patients to complete a 3-day dietary record on non-consecutive days, including one weekend day. At the nutrition visit, the eligible patients were invited to participate in the study and signed the consent form before the data collection, which was conducted by two trained registered dietitians and two nutrition undergraduate students at the Pulmonary Rehabilitation Service of the Hospital.

During the visit, data encompassing socioeconomic variables such as age, sex, self-reported ethnicity, marital status, and level of education were gathered. Clinical parameters were also collected, including smoking status, comorbidities, current medications, oxygen therapy use, and history of COPD exacerbation. The body weight and height of patients (without shoes or coats) were obtained with measurements recorded to the nearest 100 g for weight and to the nearest 0.1 cm for height, and BMI was calculated.

Adherence to HEI-2020 was our exposure and our outcomes of interest included the disease severity (primary outcome), functional capacity, life quality, dyspnea severity, and prognostic score (secondary outcomes). The evaluation of the exposure and outcomes are detailed below.

Dietary intake assessment

The usual diet was assessed by a 3-day dietary record technique (2 non-consecutive weekdays and 1 weekend day). It was revised by the research team during the visit to obtain details related to the type and amount of foods and drinks that could not be fully reported by patients. Afterward, the 3-day dietary records were transcripted to Excel. The homemade measures were converted to grams (g) or milliliters (ml) and the mean of the 3 days was calculated. Energy, carbohydrate, protein, and fatty acids (saturated, monounsaturated, and polyunsaturated) intake were estimated using the Brazilian food composition table (TACO) (26) and the American Department of Food and Agriculture Food Daa Central (USDA) (27). Data intake from macronutrients was expressed as a percentage of total daily energy.

Food was grouped according to the HEI-2020 components which include total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids (monounsaturated and polyunsaturated), refined grains, sodium, added sugar and saturated fats. Scoring components are energy-adjusted on a density basis (per 1,000 calories). Total fruits, whole fruits, total vegetables, greens and beans, total protein foods, seafood, and plant proteins can receive a maximum score of 5 points whereas the remaining components can receive a maximum score of 10 points. Sodium intake was not scored since it cannot be accurately determined by food records. The total HEI-2020 score ranges from 0 to 100 and high values indicate a better diet quality in comparison to low values. Considering that we did not evaluate the sodium intake component, in this study the overall score ranged from 0 to 90. Details on HEI-2020 components and scoring are described in **Table 1.**

Outcomes

Quality of life was evaluated by the Saint George Quality of Life Questionnaire, which comprises 50 questions divided into three domains: symptoms, activities, and impact. Symptom components include frequency and severity of several symptoms, activities domain includes activities that cause or are limited by breathlessness whereas impact components include social functioning and psychological disturbances resulting from airway disease. Each of the three domains of the questionnaire is scored separately in the range of 0 to 100%, zero score indicating no impairment of life quality. A summary score using responses to all items is the total SGRQ score. This score also ranges from zero to 100%, with higher scores indicating more limitations related to the quality of life (28). The SGRQ scores were calculated using weights to estimate the distress associated with the symptom or state described in each item in the original publication. It was self-applied by the patients during the registered dietitian visit or it was applied by the registered dietitian if patients were not able to apply it. For data analysis, the total score and the score for each domain were classified based on the median/ mean of our sample.

Lung function assessment was based on pre and post-bronchodilator forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC) values obtained from spirometry conducted within the previous 12 months. According to the FEV1 values we classified the severity of COPD as proposed by GOLD as follows: GOLD 1, or mild COPD, is characterized by an FEV1 that is 80% or more of the predicted value; GOLD 2, or moderate COPD, includes patients with an FEV1 between 50% and 79% of the predicted value; GOLD 3, or severe COPD, describes an FEV1 between 30% and 49% of the predicted value; and GOLD 4, or very severe COPD, is defined by an FEV1 less than 30% of the predicted value (3).

Functional capacity was evaluated through the distance covered in the 6-minute walk test (6MWT), conducted by a physiotherapist indoors along a straight corridor where participants walked continuously for 6 minutes, aiming to cover as much distance as possible at their own pace (29). The distance covered in the 6-minute walk was recorded in meters. For data analysis, we considered reduced functional capacity values lower than 350 meters based on the Body mass index, airflow Obstruction, Dyspnea, and Exercise capacity index (BODE) prognostic score cut-offs for the 6MWT.

Dyspnea severity was assessed using the modified Medical Research Council Dyspnea Scale (mMRC) which categorizes breathlessness on a scale from 0 to 4, with Grade 0 representing shortness of breath only with vigorous exercise and Grade 4 reflecting the most severe shortness of breath that is no longer possible to leave the home and it is experienced when getting dressed (30). The sentences were read by the registered dietitian and the patient pointed out the most appropriate sentence to describe your breathlessness. We considered worse dyspnea values equal to or higher than 3 for data analysis based on the BODE prognostic score cut-offs for the mMRC (31).

The BODE was employed by the research team to estimate mortality risk, integrating Body Mass Index (BMI), degree of airflow obstruction measured by FEV1 % predicted, severity of dyspnea according to the mMRC score, and exercise capacity determined by the 6-minute walk distance. Each component contributes to an overall score ranging from 0 to 3, with higher scores indicating an increased risk of mortality (31). For data analysis, we stratified patients based on BODE median values and considered values higher than the median indicative of a worse prognosis.

Statistical analysis

Statistical analysis was conducted using the R software (version 2024.04.2+764). Data normality was assessed using the Kolmogorov-Smirnov test. Quantitative variables were reported as mean ± standard deviation or median (interquartile range), depending on the data distribution, while categorical variables were presented as absolute and relative frequencies.

For data analysis we categorized the exposition and the quantitative outcomes. HEI score was categorized according to the tertiles of data distribution and diet quality was classified as low (1st tertile), medium (2nd tertile) and high (3rd tertile). The BODE index was categorized as $\geq$ 5 points and < five points with the first category representing the "worse prognosis", 6MWT was described as $\geq$ 350 meters and < 350 meters to define reduced and non-reduced functional capacity, respectively. Indeed, the SGRQ scores for each domain and for overall quality of life were categorized by the median/mean values obtained in our sample and the values equal or higher than the median/mean indicated worse quality of life. Also, mMRC scale score was presented as $\geq$ 3 and < 3 points, with the first category representing "worse dyspnea". Exacerbator phenotype was described as a dichotomous data (present or absent) and the severity of disease was described by grouping the stages GOLD GOLD 1-2 and GOLD 3-4.

Patients' features and outcomes across HEI score tertiles were compared using the ANOVA, the Kruskal-Wallis test, Fisher's exact test, and Pearson's chi-squared test according to the data distribution. The Tukey test was applied for post-hoc comparison. Logistic regression analysis was performed to evaluate the association between HEI score tertiles and the study outcomes, adjusted for important clinical factors (age, origin, and smoking status). Multicollinearity was explored by the VIF factor.

Results

General features of participants

During the period of study 175 patients were evaluated by the Nutrition Team and 134 had a confirmed diagnosis of COPD. Considering their energy intake, 99 patients were eligible for the current study. The general features of participants are presented in **Table 2**.

The majority of patients were women (63.6%) and had a mean age equal to 67.2 ± 8.4 years. Most participants self-identified as White/Caucasian (81.8%), 86.9% reported a history of smoking and were ex-smoker (86.9%). Also, 44.0% of the sample was classified with normal weight followed by overweight (24%) and obesity (21.0%).

COPD stages GOLD 2 and 3 were the most frequent (32.3% and 33.3%), with a median post-bronchodilator FEV1% equal to 43.5 (range: 28.0–60.0). Most of the sample scored more than 3 points on the mMRC scale (61.0%) and scored more than 5 points in the BODE index, which indicates a more severe level of dyspnea and a worse prognosis. In contrast, 60.0% of the patients walked more than 350m when performing the 6MWT. In the SGRQ domains of Impact and Symptoms, 51.0% of participants scored above the mean, while in the Activity domain, the frequency of scores above and below the median showed no difference. Total SGRQ scores above the mean were also more prevalent among patients, indicating a lower quality of life.

Regarding dietary intake, the median total energy intake was 1889.2 kcal, corresponding to 29.7 kcal/kg. The intake of macronutrients - carbohydrates, protein, and total fatty acids - was 57.6 ± 8.5%, 16.4% (range: 14.7 - 19.0), and 33.2 ± 6.0%, respectively.

Diet quality of COPD *patients assessed by HEI-2020*

The mean HEI-2020 total score was 56.5 ± 8.4. Components such as total vegetables, whole grains, total protein foods, seafood and plant proteins, and refined grains presented the lowest scores. **Table 3** presents the score attributed to each component of HEI. Patients in the 1st tertile of diet quality presented higher consumption of total and saturated fatty acids and lower intake of dietary fiber per 1000 kcal, as shown in **Table 4**. In contrast, participants in the 3rd tertile presented a higher consumption of total fruits, whole fruits, whole grains, dairy and total protein. Total vegetables, greens and beans, seafood and plant proteins and added sugars did not differ between the groups.

Association between HEI-2020 and COPD patients

Table 5 presents the comparison of general features and outcomes of interest between patients grouped according to the tertiles of HEI score. Participants did not differ among tertiles of HEI score in age, sex, ethnicity, level of education, smoking status, number or type of comorbidities and COPD severity. Lung function parameters were not different among groups except when comparing the FVC values pre and post-bronchodilator, that were higher on patients with medium diet quality (2nd tertile of HEI) compared to the other groups.

Nutritional characteristics were not different between patients grouped according to the categories of HEI. Also, functionality and quality of life were not associated with diet quality.

Participants of the lower HEI score tertile presented a worst prognosis compared with patients of the medium and higher HEI score tertile, demonstrated by the frequency of patients with BODE index $\geq$ 5 points. But, In the multivariate analysis it was not observed a significant association between diet quality and worse prognosis neither in the crude model [OR (2nd tertile) = 1.86, IC95% 0.62 - 5.61) and OR (3rd tertile) = 0.46, IC95% 0.16 - 1.315)] nor in the model adjusted for age, origin, and smoking status [OR (2nd tertile) = 2.29 IC95% 0.71 - 7.38) and OR (3rd tertile) = 0.54, IC95% 0.173 - 1.69)]

Discussion

This study aimed to evaluate the association between diet quality and clinical outcomes in outpatients with COPD. HEI-2020 was used to evaluate diet quality, and it presented a relatively low mean (equal to 56.6 ± 8.4). Diet quality was not associated with COPD severity, exacerbator phenotype, dyspnea, quality of life, functional capacity and worse prognosis.

Considering that we did not evaluate the sodium intake as a component of HEI-2020 score, the maximum punctuation for diet quality in our sample could be 90 and the overall HEI score was 56.6 ± 8.4, with higher scores on whole fruits, greens and beans, saturated fat acids and added sugars. In contrast, the lowest scores were in the refined grains, seafood and plant proteins, and whole grains components. Of the two studies that we found in the literature evaluating the association between HEI scores and clinical outcomes in patients with COPD, none did not report mean HEI scores, nor detailed their components (22,24). Both studies were conducted with Iranian hospitalized COPD patients and the diet was categorized according to HEI as a poor diet (HEI <51), needs improvement (HEI between 51 and 80) and good diet (HEI> 80). Most patients were included in the category "needs improvement" when using HEI-2005 (79.3%) and HEI-2010 (60.3%). Although the patients included in these studies presented a diet quality better than our sample, it also needs improvements highlighting the challenges of maintaining high-quality diets among COPD patients, particularly in regions with socioeconomic and access barriers.

In the current study diet quality was not associated with severity of COPD, dyspnea, functional capacity, quality of life and prognosis. The lack of association between HEI scores and clinical outcomes may be explained by the overall low HEI score observed in our sample. This suggests that high HEI scores can be necessary to ensure healthy benefits for COPD patients. Additionally, the advanced stage of disease, smoking and comorbidities can overshadow the potential impact of diet quality on clinical outcomes. Patients in advanced stages experience severe airflow obstruction, heightened systemic inflammation, and reduced physical activity, which may reduce the potential effects of a nutrient-rich diet due to the overwhelming physiological burden of advanced disease. Smoking, as a primary risk factor for COPD, causes lung damage, chronic inflammation, and oxidative stress, potentially masking the benefits of dietary interventions. Also, comorbidities such as cardiovascular disease, diabetes, and metabolic syndrome independently affect clinical outcomes, influencing metabolic and inflammatory pathways in ways that may obscure the role of diets (3). In accordance with our results, the other two studies involving COPD patients that evaluated diet quality by HEI score did not demonstrate a significant association between HEI-2005 and HEI-2010 and sleep quality nor between HEI-2020 and lung function (22,24). As described above in these studies the majority of patients were included in the HEI category of "diet quality needs improvement".

A diet with a higher HEI score provides more fruits, vegetables, whole grains, and lean proteins, and offers high levels of antioxidants, which help mitigate oxidative stress. Antioxidants, such as vitamins C and E, found in these foods, can counteract free radicals, reducing the oxidative stress that exacerbates lung damage (32). Also, diets that align with higher HEI scores are typically high in fiber, which has been associated with reduced inflammation (33). Fiber modulates the gut microbiota, acting as a prebiotic, promoting the growth of beneficial gut bacteria that ferment fiber into short-chain fatty acids (SCFA), such as butyrate. SCFAs have systemic anti-inflammatory properties and can reduce pro-inflammatory cytokines like IL-6 and TNF-α, which are elevated in COPD patients (34). Additionally, fibers like β-glucans enhance the body's antioxidant defenses by reducing oxidative stress markers and advanced glycation end-products (AGEs), which are typically elevated in individuals with COPD (35). Furthermore, SCFAs derived from fiber help regulate immune responses by modulating T-cell activity and reducing chronic inflammation, which is particularly beneficial in COPD, where immune dysregulation exacerbates lung damage. High fiber intake is linked to a lower prevalence of COPD, asthma, and chronic bronchitis, due to its ability to reduce oxidative stress and improve immune responses (34). Generally, a higher HEI score diet will have less saturated fats and refined sugars, which have been linked to worsened respiratory symptoms and increased inflammation (35).

This study presents strengths that enhance the reliability and accuracy of its findings. Data collection was conducted by trained evaluators, ensuring standardization in measurement procedures and minimizing inter-rater variability. Dietary intake was assessed through a detailed 3-day food record, which was reviewed with each participant to capture specifics about food preparation methods and portion sizes, increasing the validity of dietary data. Furthermore, nutrient composition and intake levels for macro- and micronutrients were calculated using validated food composition tables, ensuring accurate representation of participants nutritional intake. However, there are limitations such as the inherent challenges of dietary assessment instruments. Self-reported dietary data, such as food records, are prone to biases, with participants potentially underestimating or overestimating their intake, which could impact the accuracy of dietary intake data. Additionally, the use of a convenience sample limits the generalizability of the findings, as the sample may not fully represent the broader population of individuals with similar conditions. We excluded participants that recorded energy intake out of a 90% of the confidence interval of the sample. This approach of relying solely on dietary intake self-reported data to assess energy consumption may lack rigor, because it can have included patients with potential underreporting or overreporting of their food intake. An ideal approach would be to complement these methods with objective markers, such as urinary urea levels, which provide a more accurate assessment of protein intake and help address issues of self-report bias. Future studies evaluating clinical outcomes and diet quality in patients with COPD are needed, as there is a limited amount of studies on this topic. This will help to elucidate the potential relationship between diet and COPD and allow the establishment of personalized dietary interventions for these patients.

Conclusions

This sample of COPD outpatients exhibited a relatively low mean HEI-2020 score, suggesting the need for diet quality improvement. However, diet quality was not associated with clinical outcomes in this study.

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CONFLICTS OF INTEREST

The authors have no relevant interests to declare.

AUTHOR CONTRIBUTION

Silva FM contributed to the conception of the study. Hartmann AS, Brum JGG, Silva FM, Ignacio C contributed to the acquisition of data. Silva FM and Zucatti K contributed to data analysis and interpretation. Ignacio C and Silva FM drafted the manuscript. All the authors critically revised the article, provided final approval, and agreed to be accountable for all aspects of work, ensuring integrity and accuracy.

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Table 1. Healthy Eating Index-2020 components, point values, and standards for scoring.

Component	Maximum points	Standard for maximum score	Standard for minimum score
Adequacy			
Total Fruits	5	≥0.8 c equivalents/1,000 kcal	No fruit
Whole Fruits	5	≥0.4 c equivalents/1,000 kcal	No whole fruit
Total Vegetables	5	≥1.1 c equivalents/1,000 kcal	No vegetables
Greens and Beans	5	≥0.2 c equivalents/1,000 kcal	No dark green vegetables or beans and peas
Whole Grains	10	≥1.5 oz equivalents/1,000 kcal	No whole grains
Dairy	10	≥1.3 c equivalents/1,000 kcal	No dairy
Total Protein Foods	5	≥2.5 oz equivalents/1,000 kcal	No protein foods
Seafood and Plant Proteins	5	≥0.8 c equivalents/1,000 kcal	No seafood or plant proteins
Fatty Acids	10	(PUFAs+MUFAs)/SFAs≥2.5	(PUFAs+MUFAs)/SFAs ≤1.2
Moderation			
Refined Grains	10	≤1.8 oz equivalents/1,000 kcal	≥4.3 oz equivalents/1,000 kcal
Sodium	Not evaluated		
Added Sugars	10	≤6.5% of energy	≥26% of energy

Saturated Fats	10	≤8% of energy	≥16% of energy

Abbreviations: c: cups; oz: ounces; PUFA: polyunsaturated fatty acids; MUFAS: monounsaturated fatty acids; SFA: saturated fatty acids.

Table 2. Clinical, sociodemographic and nutritional features of COPD outpatients (n = 99)

Variables	Descriptive statistics
Sociodemographic features	
Age (years)	67.2 ± 8.3
Sex (females)	63.0 (63.6)
Self-reported Ethnicity (White)	81.0 (81.8)
Marital status	
Single	20.0 (21.0)
Married	43.0 (45.2)
Widowed	21.0 (22.1)
Divorced	11.0 (11.5)
Level of education	
Elementary School	64.0 (64.6)
High school	15.0 (15.1)
College	20.0 (20.2)
Smoking Status	
Never smoked	4.0 (4.0)
Ex-smoker	86.0 (86.9)
Active smoker	9.0 (9.1)
Clinical features	
Number of Comorbidities	1.4 (0.0 - 4.2)

Hypertension	53.0 (53.5)
Cardiovascular diseases	27.0 (27.2)
Diabetes mellitus	17.0 (17.1)
COPD Severity - GOLD stage	
1	6.0 (6.0)
2	32.0 (32.3)
3	33.0 (33.3)
4	28.0 (28.2)
Exacerbator phenotype	34.0 (34.3)
Pre - bronchodilator FEV %	37.0 (25.4 - 54.0)
Pre - bronchodilator FVC %	60.5 ± 15.6
Pre - bronchodilator FEV/FVC %	57.0 (44.9 - 72.0)
Post-bronchodilator FEV %	43.5 (28.0 - 60.0)
Post-bronchodilator FVC %	64.1 ± 16.5
Post-bronchodilator FEV/FVC %	60.4 ± 20.2
6MWT (m)	393.5 (290.0 - 452.2)
Reduced functional capacity (6MWT < 350 m)	34.0 (40.0)
SGRQ total score	49.9 ± 19.1
Reduced total quality score (≥ 50 points)	44.0 (51.0)

SGRQ Symptoms score	48.9 ± 24.0
Reduced symptoms score (≥ 49 points)	44.0 (51.0)
SGRQ Activities score	68.0 (54.0 - 86.4)
Reduced activities score (≥ 43 points)	43.0 (50.0)
SGRQ Impact score	38.6 ± 19.6
Reduced impact score (≥ 39 points)	44.0 (51.0)
mMRC dyspnea scale	3.0 (2.0 - 4.0)
Worse dyspnea (≥ 3)	60.0 (61.0)
BODE prognosis score	4.0 (3.0 - 6.0)
Worse prognosis (≥ 5 points)	43.0 (51.0)
Nutritional and dietary features	
Actual body weight (Kg)	65.9 ± 18.0
Body mass index - BMI (Kg/m^2)	25.5 ± 6.1
Nutritional status by BMI	
Underweight	10.0 (10.1)
Normal weight	44.0 (44.4)
Overweight	24.0 (24.2)
Obesity	21.0 (21.2)
Energy intake	

Total energy (Kcal/day) Total energy adjusted by weight (Kcal/Kg/day)	1889.2 (1506.7 - 2273.6) 29.6 (22.6 - 37.8)
Carbohydrate - % of total energy	57.5 ± 8.4
Protein - % of total energy	16.4 (14.7 - 19.0)
Lipids - % of total energy Saturated fatty acids - % of total energy Monounsaturated fatty acids - % of total energy Polyunsaturated fatty acids - % of total energy	33.2 ± 6.0 10.4 (8.1 - 12.7) 10.2 (8.3 - 12.6) 8.1 (5.8 - 10.0)
Colesterol (mg/1000 kcal)	134.1 (103.8 - 12.6)
Fiber (g/1000 kcal)	9.8 (7.5 - 12.6)

Abbreviations: FEV: forced expiratory volume; FVC: forced vital capacity; BMI: body mass index; 6MWT: 6 minute walking test; SGRQ: Saint George respiratory questionnaire; mMRC: modified medical research council; BODE: body mass index, obstruction, dyspnea and exercise score.

Data are presented as mean ± standard deviation or median (P25-P75) or absolute (relative) frequency.

Table 3. Consumption and score for each HEI-2020 component

Component	g/1000kcal	Score
Total Fruits	93.11 (48.17 - 155.33)	4.27 (2.21 - 5.00)
Whole Fruits	79.01 (28.93 - 127.03)	5.00 (2.90 - 5.00)
Total Vegetables	33.47 (14.38 - 64.33)	1.12 (0.48 - 2.15)
Greens and Beans	32.76 (10.43 - 67.03)	5.00 (1.93 - 5.00)
Whole Grains	0.00 (0.00-16.60)	0.00 (0.00 - 0.86)
Dairy	101.60 (33.84 - 159.59)	5.00 (1.91 - 6.12)
Total Protein Foods	201.69 (145.89 - 280.99)	2.97 (2.15 - 4.13)
Seafood and Plant Proteins	37.13 (17.59 - 72.97)	1.70 (0.82 - 3.42)
Fatty Acids	1.77 (1.465 - 2.14)	4.33 (1.96 - 7.22)
Refined Grains	119.37 (80.61 - 150.26)	0.37 (0.00 - 5.83)
Sodium	-	-
Added Sugars	0.94 (0.00 - 3.32)	10.00 (10.00 - 10.00)
Saturated Fats	10.39 (8.30 - 12.78)	7.00 (3.98 - 9.65)
Total score	-	56.55 ± 8.43

Table 4. Dietary data ad HEI-2020 components of COPD outpatients grouped by HEI-2020 tertis

	HEI Lower score	HEI Medium Score	HEI High score	p-value
Energy intake (kcal)				
Total	1,950 (1.776 - 2.247)	1,921 (1,581 - 2.100)	1,726 (1,498 - 2,038)	0.117b
Per kg	30.5 (23.5 - 37.4)	29.9 (23.7 - 37.9)	27.6 (21.8 - 35.0)	0.524b
Carbohydrate (%)	44.9 ± 8.32	47.4 ± 8.60	48.7 ± 7.83	0.180a
Protein (g)				
Total	82.4 (74.0 - 106.0)	74.8 (65.8 - 87.9)	77.6 (58.6 - 91.9)	0.253b
Per kg	1.33 (1.07 - 1.53)	1.15 (0.92 - 1.74)	1.24 (0.89 - 1.55)	0.559b
Fatty acids (g)				
Total	78.7 ± 21.7	71.6 ± 22.0	65.2 ± 16.4	0.028a
%	36.1 ± 7.75	32.7 ± 6.04	32.6 ± 7.57	0.087a
Saturated (%)	12.1 (9.08 - 15.0)	10.8 (8.28 - 12.5)	8.7 (7.89 - 10.40)	0.007b
Monounsaturated (%)	11.8 (8.93 - 14.20)	9.99 (8.21 - 12.0)	9.74 (8.6 - 12.7)	0.242b
Polyunsaturated (%)	7.59 (5.08 - 9.03)	7.98 (6.02 - 9.60)	8.86 (6.19 - 11.20)	0.181b
Cholesterol (mg)	274 (226 - 337)	220 (186 - 348)	272 (146 - 312)	0.379b
Cholesterol (g/1000kcal)	141 (114 - 175)	131 (101 - 168)	129 (98.2 - 171)	0.441b
Fiber (g)				
Total	17.2 (11.5 - 22.0)	19.7 (14.2 - 24.3)	20.8 (15.5 - 27.4)	0.056b
Per 1000kcal	9.03 (6.38 - 10.60)	10.3 (7.67 - 12.60)	12.6 (9.34 - 14.30)	0.001b
HEI-2020 components				
Total Fruits				
g/1000kcal	47.6 (11.8 - 82.9)	93.1 (66.0 - 125.0)	125.0 (86.6 - 188.0)	0.001b
Score	2.18 (0.54 - 3.80)	4.27 (3.03 - 5.00)	5.00 (3.97 - 5.00)	0.001b
Whole Fruits				
	30 (0 - 80)	91 (66 - 111)	125 (68 - 159)	<0.001b

g/1000kcal Score	2.81 (0.00 - 5.00)	5.00 (5.00 - 5.00)	5.00 (5.00 - 5.00)	<0.001b
Total Vegetables g/1000kcal Score	26.1 (8.01 - 48.60) 0.87 (0.27 - 1.62)	34.4 (13.0 - 52.2) 1.15 (0.43 - 1.74)	44.0 (15.4 - 86.6) 1.47 (0.51 - 2.90)	0.188b 0.189b
Greens and Beans g/1000kcal Score	32.8 (6.68 - 52.90) 5.00 (1.24 - 5.00)	35.1 (8.62 - 71.50) 5.00 (1.60 - 5.00)	33.7 (17.60 - 68.70) 5.00 (3.26 - 5.00)	0.537b 0.486b
Whole Grains g/1000kcal Score	0 (0 - 12.8) 0 (0 - 0.63)	0 (0 - 2.82) 0 (0 - 0.14)	21.4 (0 - 42.7) 1.05 (0 - 2.09)	<0.001b <0.001b
Dairy g/1000kcal Score	56.3 (18.4 - 125.0) 3.18 (1.04 - 5.00)	88.2 (44.9 - 166.0) 4.98 (2.54 - 5.25)	111.0 (83.0 - 164.0) 5.00 (4.69 - 6.28)	0.047b 0.027b
Total Protein Foods g/1000kcal Score	157 (128 - 219) 2.30 (1.88 - 3.22)	194 (136 - 237) 2.86 (2.00 - 3.49)	256 (183 - 287) 3.76 (2.69 - 4.22)	0.033b 0.034b
Seafood and Plant Proteins g/1000kcal Score	32.8 (9.11 - 52.9) 1.50 (0.42 - 2.43)	38.7 (29.5 - 75.6) 1.78 (1.35 - 3.47)	48.8 (26.8 - 83.2) 2.24 (1.23 - 4.10)	0.154b 0.125b
Fatty Acids	1.62 ± 0.42	1.80 ± 0.47	2.08 ± 0.52	<0.001a

g/1000kcal Score	3.26 (0.75 - 4.47)	4.53 (2.10 - 7.41)	6.33 (4.41 - 8.10)	0.004b
Refined Grains g/1000kcal Score	131.0 ± 38.7 0 (0 - 1.62)	120.0 ± 45.2 0 (0 - 5.29)	93.4 ± 53.4 6.12 (0.32 - 9.24)	0.004a <0.001b
Added Sugars g/1000kcal Score	0.89 (0 - 2.70) 10 (10 - 10)	1.21 (0 - 5.89) 10 (10 - 10)	0.87 (0 - 3.30) 10 (10 - 10)	0.255b 0.143b
Saturated Fats g/1000kcal Score	12.1 (9.08 - 15.0) 4.93 (1.34 - 8.65)	10.6 (9.32 - 12.50) 6.77 (4.40 - 9.64)	8.71 (7.89 - 10.40) 9.11 (7.01 - 10.00)	0.006b 0.004b
Total score	47.6 ± 3.54	56.1 ± 1.90	66.2 ± 5.57	<0.001a

a - ANOVA; b - Kruskal-Wallis.

Table 5. Sociodemographic, clinical, and nutritional features of COPD outpatients grouped according to the tertiles of HEI score .

Variables	**HEI** **Lower score** **(n = 33)**	**HEI** **Medium Score** **(n = 33)**	**HEI** **Higher score** **(n = 33)**	**p-value**

Sociodemographic features				
Age (years)	65.7 ± 7.99	69.8 ± 9.53	66.7 ± 7.65	0.117_a
Sex (females)	20 (61)	19 (58)	24 (73)	0.399_b
Self-reported Ethnicity (White)	27 (82)	26 (79)	28 (85)	0.815_b
Smoking Status Never smoked Ex-smoker Active smoker	 0 (0) 29 (88) 4 (12)	 4 (12) 26 (79) 3 (9.1)	 0 (0) 31 (94) 2 (6.1)	 0.095_c
Clinical features				
Number of Comorbidities	1 (0-2)	1 (0-2)	1 (1- 2)	0.145_b
COPD Severity - GOLD stage 1 and 2 3 and 4	 11 (33) 22 (66)	 15 (45) 18 (54)	 12 (36) 21 (63)	0.573_c
Exacerbator phenotype	9 (29)	9 (27)	12 (39)	0.575_b
Pre - bronchodilator FEV %	34.0 (25.2 - 52.2)	45.0 (33.2 - 57.0)	30.0 (25.0 - 52.5)	0.221_d
Pre - bronchodilator FVC %	56.3 ± 14.5	68.0 ± 17.1	59.0 ± 16.0	0.013_a
Pre - bronchodilator FEV/FVC %	60.5 ± 14.9	61.7 ± 17.9	56.9 ± 25.2	0.598_a
Post-bronchodilator FEV %	39.5 (28.8 - 60.0)	53.0 (36.5 - 65.5)	34.0 (26.0 - 60.0)	0.246_d
Post-bronchodilator FVC %	60.6 ± 15.6	71.0 ± 16.3	62.9 ± 17.9	0.043_a
Post-bronchodilator FEV/FVC %	61.9 ± 15.6	62.0 ± 18.3	58.0 ± 21.9	0.612_a
Weight (kg)	63.0 (55.5 - 80.1)	62.9 (53.5 - 74.4)	65.3 (52.7 - 80.6)	0.783_d

Height (m)	1.58 (1.50 - 1.68)	1.62 (1.55 - 1.68)	1.56 (1.52 - 1.63)	0.439_d
BMI (kg/m²)	25.8 (23.1 - 28.4)	23.6 (20.4 - 28.5)	24.9 (20.0 - 31.6)	0.577_d
6MWT (m) Reduced functional capacity	378 (296 - 481) 10 (30.3)	388 (344 - 446) 12 (36.4)	392 (240 - 449) 12 (36.4)	0.778_d 0.385
SGRQ Total score Worse quality of life	51.1 ± 19.9 15 (45.5)	50.5 ± 18.0 17 (51.5)	47.7 ± 20.5 12 (36.4)	0.786_a 0.668
SGRQ Symptoms score Worse symptoms	52.7 ± 25.3 17 (51.5)	49.0 ± 25.1 15 (45.5)	47.5 ± 24.1 12 (36.4)	0.719_a 0.720
SGRQ Activities score Worse activities	70.0 (59.8 - 86.2) 14 (42.4)	73.8 (59.5 - 87.2) 16 (48.5)	73.0 (45.7 - 86.7) 13 (39.4)	0.822_d 0.786
SGRQ Impact score Worse impact	39.8 ± 21.0 15 (45.5)	38.5 ± 17.5 16 (48.5)	36.6 ± 21.3 13 (39.4)	0.837_a 0.820
mMRC dyspnea score Worse dyspnea	3 (2- 4) 21 (63.6)	3 (2 - 4) 20 (60.6)	3 (2 - 5) 19 (57.6)	0.578_d 0.881
BODE prognosis score Worse prognosis	6 (4 - 7) 17 (51.5)	4 (3 - 6) 10 (30.3)	5 (3 - 7) 16 (48.5)	0.199_d 0.047

$_a$ - ANOVA; $_b$ - Chi-square; $_c$ - Fisher's exact test; $_d$ - Kruskal-Wallis

Abbreviations: FEV: forced expiratory volume; FVC: forced vital capacity; BMI: body mass index; 6MWT: six-minute walking test; SGRQ: Saint George respiratory questionnaire; mMRC: modified medical research council; BODE: body mass index, obstruction, dyspnea, and exercise score.

Supplementary material. STROBE-nut: An extension of the STROBE statement for nutritional epidemiology

Item	Item nr	STROBE recommendations	Extension for Nutritional Epidemiology studies (STROBE-nut)	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract.	nut-1 State the dietary/nutritional assessment method(s) used in the title, abstract, or keywords.	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found.		1
Introduction				
Background rationale	2	Explain the scientific background and rationale for the investigation being reported.	-	2
Objectives	3	State specific objectives, including any pre-specified hypotheses.		3
Methods				
Study design	4	Present key elements of study design early in the paper.		
Settings	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	nut-5 Describe any characteristics of the study settings that might affect the dietary intake or nutritional status of the participants, if applicable.	3, 4

Participants	6	a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up. Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls. Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants. (b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed. Case-control study—For matched studies, give matching criteria and the number of controls per case.	nut-6 Report particular dietary, physiological or nutritional characteristics that were considered when selecting the target population.	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	nut-7.1 Clearly define foods, food groups, nutrients, or other food components. nut-7.2 When using dietary patterns or indices, describe the methods to obtain them and their nutritional properties.	5,6,7 5

Data sources - measurements	8	For each variable of interest, give sources of data and details of methods of assessment (measurement).Describe comparability of assessment methods if there is more than one group.	nut-8.1 Describe the dietary assessment method(s), e.g., portion size estimation, number of days and items recorded, how it was developed and administered, and how quality was assured. Report if and how supplement intake was assessed.	5
			nut-8.2 Describe and justify food composition data used. Explain the procedure to match food composition with consumption data. Describe the use of conversion factors, if applicable.	5
			nut-8.3 Describe the nutrient requirements, recommendations, or dietary guidelines and the evaluation approach used to compare intake with the dietary reference values, if applicable.	5
			nut-8.4 When using nutritional biomarkers, additionally use the STROBE Extension for Molecular Epidemiology (STROBE-ME). Report the type of biomarkers used and their usefulness as dietary exposure markers.	NA
			nut-8.5 Describe the assessment of nondietary data (e.g., nutritional status and influencing factors) and timing of the assessment of these variables in relation to dietary assessment.	4
			nut-8.6 Report on the validity of the dietary or nutritional assessment methods and any internal or external validation used in the study, if applicable.	5
Bias	9	Describe any efforts to address potential sources of bias.	nut-9 Report how bias in dietary or nutritional assessment was addressed, e.g., misreporting, changes in habits as a result of being measured, or data imputation from other sources	5
Study Size	10	Explain how the study size was arrived at.		

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	nut-11 Explain categorization of dietary/nutritional data (e.g., use of N-tiles and handling of nonconsumers) and the choice of reference category, if applicable.	5
Study Size	10	Explain how the study size was arrived at.		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	nut-11 Explain categorization of dietary/nutritional data (e.g., use of N-tiles and handling of nonconsumers) and the choice of reference category, if applicable.	5
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions. (c) Explain how missing data were addressed. (d) Cohort study—If applicable, explain how loss to follow-up was addressed. Case-control study—If applicable, explain how matching of cases and controls was addressed.	nut-12.1 Describe any statistical method used to combine dietary or nutritional data, if applicable. nut-12.2 Describe and justify the method for energy adjustments, intake modeling, and use of weighting factors, if applicable. nut-12.3 Report any adjustments for measurement error, i.e,. from a validity or calibration study.	7 5 5

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy. (e) Describe any sensitivity analyses.		
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions. (c) Explain how missing data were addressed. (d) Cohort study—If applicable, explain how loss to follow-up was addressed. Case-control study—If applicable, explain how matching of cases and controls was addressed. Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy. (e) Describe any sensitivity analyses.	nut-12.1 Describe any statistical method used to combine dietary or nutritional data, if applicable. nut-12.2 Describe and justify the method for energy adjustments, intake modeling, and use of weighting factors, if applicable. nut-12.3 Report any adjustments for measurement error, i.e,. from a validity or calibration study.	7 5 5
Results				

Participants	13	(a) Report the numbers of individuals at each stage of the study—e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed. (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram.	nut-13 Report the number of individuals excluded based on missing, incomplete or implausible dietary/nutritional data.	8
Descriptive data	14	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) Cohort study—Summarize follow-up time (e.g., average and total amount)	nut-14 Give the distribution of participant characteristics across the exposure variables if applicable. Specify if food consumption of total population or consumers only were used to obtain results.	8
Outcome data	15	Cohort study—Report numbers of outcome events or summary measures over time. Case-control study—Report numbers in each exposure category, or summary measures of exposure.		

		Cross-sectional study—Report numbers of outcome events or summary measures.		
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized. (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.	nut-16 Specify if nutrient intakes are reported with or without inclusion of dietary supplement intake, if applicable.	14
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions and sensitivity analyses.	nut-17 Report any sensitivity analysis (e.g., exclusion of misreporters or outliers) and data imputation, if applicable.	
Discussion				
Key results	18	Summarize key results with reference to study objectives.		
Limitation	19	Discuss limitations of the study, taking into account sources of potential bias or	nut-19 Describe the main limitations of the data sources and assessment methods used and implications for the interpretation of the findings.	12

		imprecision. Discuss both direction and magnitude of any potential bias.		
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	nut-20 Report the nutritional relevance of the findings, given the complexity of diet or nutrition as an exposure.	12
Generalizability	21	Discuss the generalizability (external validity) of the study results.		
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.		
Ethics			nut-22.1 Describe the procedure for consent and study approval from ethics committee(s).	3
Supplementary material			nut-22.2 Provide data collection tools and data as online material or explain how they can be accessed.	5

CONSIDERAÇÕES FINAIS

A DPOC representa uma das principais causas de morbimortalidade em nível global, afetando milhões de pessoas e gerando um enorme impacto econômico e social. Caracterizada pela limitação progressiva e irreversível do fluxo aéreo, a DPOC é predominantemente associada ao tabagismo, mas também pode ser exacerbada por fatores ambientais, como a poluição do ar, e predisposições genéticas. A doença é marcada por um processo inflamatório crônico nas vias aéreas, o que resulta em dificuldades respiratórias, tosse crônica, produção excessiva de muco e, em estágios mais avançados, insuficiência respiratória. Com o tempo, os pacientes podem sofrer perda significativa da capacidade funcional, levando à dependência de oxigênio, hospitalizações frequentes e redução substancial da qualidade de vida. A sobrecarga de comorbidades, como doenças cardiovasculares e diabetes, também agrava o quadro clínico, tornando o manejo da DPOC um desafio. Embora os tratamentos farmacológicos e as terapias de reabilitação pulmonar desempenhem um papel crucial no controle dos sintomas e na melhoria da qualidade de vida, as estratégias convencionais nem sempre são suficientes para impedir a progressão da doença. Isso tem motivado a busca por abordagens complementares e alternativas, como a influência de fatores dietéticos na evolução da DPOC. A alimentação, por sua vez, tem sido identificada como um fator modificável que pode potencialmente desempenhar um papel importante no manejo e na melhoria da função pulmonar dos pacientes com DPOC. No entanto, a literatura sobre o impacto de padrões alimentares específicos, como a dieta mediterrânea ou o Índice de Alimentação Saudável (HEI), ainda carece de evidências robustas que comprovem sua eficácia de forma consistente. Esta dissertação procurou explorar mais a fundo essa relação, com ênfase em dois objetivos principais: realizar uma revisão de escopo da literatura existente sobre a influência dos padrões alimentares no risco e nos desfechos clínicos da DPOC, e conduzir um estudo transversal com pacientes ambulatoriais para investigar como a qualidade da dieta, medida pelo HEI-2020, se correlaciona com desfechos clínicos.

A revisão de escopo destacou que, embora existam dados substanciais que sugerem benefícios de padrões alimentares saudáveis, como a dieta mediterrânea e a adesão ao Healthy Eating Index (HEI), a maior parte da literatura disponível se concentra no risco de desenvolvimento da DPOC, em vez de explorar os desfechos clínicos em pacientes já diagnosticados com a doença. Isso evidencia a necessidade de mais estudos que investiguem como a alimentação pode afetar diretamente a progressão da DPOC, a capacidade funcional e a qualidade de vida dos pacientes. Além disso, embora muitos estudos indiquem que padrões alimentares saudáveis, especialmente aqueles ricos em frutas, vegetais, grãos integrais e azeite de oliva, apresentam associações protetoras, há lacunas significativas nos métodos de avaliação dietética, o que dificulta a aplicação prática e a comparabilidade dos resultados.

O estudo transversal realizado com pacientes ambulatoriais diagnosticados com DPOC também contribuiu para a compreensão da relação entre a qualidade da dieta e os desfechos clínicos. Embora a análise tenha revelado que a maioria dos pacientes apresentava uma qualidade dietética abaixo do ideal, com escores baixos no HEI-2020, não foram encontradas associações significativas entre a qualidade da dieta e os principais desfechos clínicos, como a gravidade da doença, função pulmonar ou prognóstico. Isso pode estar relacionado à heterogeneidade da amostra, ao caráter transversal do estudo e à complexidade de fatores que influenciam os desfechos clínicos em pacientes com DPOC.

Apesar da ausência de associações claras entre dieta e desfechos clínicos nesta amostra, os resultados sugerem que a qualidade da alimentação é uma área importante que merece atenção nas estratégias terapêuticas para pacientes com DPOC. A falta de aconselhamento dietético adequado e o consumo de alimentos de baixa qualidade são fatores que devem ser abordados em intervenções nutricionais direcionadas a essa população, com o intuito de melhorar não só o prognóstico da doença, mas também a qualidade de vida dos pacientes.

A dissertação evidencia a necessidade urgente de mais estudos longitudinais e randomizados, que possam confirmar os achados preliminares sobre a relação entre dieta e DPOC, além de identificar quais padrões alimentares são mais eficazes em termos de prevenção e tratamento da doença. Também é fundamental que esses estudos considerem variáveis como a adesão a recomendações dietéticas, fatores socioeconômicos, tabagismo e comorbidades, para oferecer uma visão mais abrangente e precisa dos impactos da alimentação na DPOC.

Em síntese, esta dissertação contribui para a literatura sobre a relação entre alimentação e DPOC, ao destacar a importância de padrões alimentares saudáveis para a prevenção e, potencialmente, para a melhoria dos desfechos clínicos na DPOC. No entanto, novas pesquisas são necessárias para esclarecer a influência direta da dieta na progressão da doença e no manejo clínico, permitindo o desenvolvimento de estratégias nutricionais mais eficazes e individualizadas para pacientes com DPOC.