

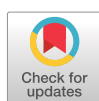


# Influence of ethnicity on adherence to nonsurgical interventions for COPD: a scoping review

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People with COPD from minority ethnic communities tended to have poorer adherence to nonsurgical treatment interventions. Identifying the specific factors underpinning this effect may help improve outcomes among COPD patients, regardless of ethnicity. <https://bit.ly/3PD89KH>

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## Abstract

**Objective:** Poor therapeutic adherence and the contributing factors have been extensively researched in several chronic diseases, including COPD. However, the influence of ethnicity on adherence to nonsurgical treatment interventions for COPD (*e.g.* smoking cessation and pulmonary rehabilitation) is not well understood. This scoping review was performed to better understand variations in adherence among people from minority ethnic communities diagnosed with COPD.

**Method:** This scoping review was designed based on the refined frameworks of Arksey and O'Malley, developed by JBI (Joanna Briggs Institute). Systematic searches were performed across three databases: CINHAL (EBSCO), MEDLINE (Ovid) and Embase (Ovid).

**Results:** Out of 3654 identified records, 37 studies were deemed eligible for inclusion; these were conducted in various countries and involved populations of diverse ethnic groups diagnosed with COPD. The included studies considered provision and/or adherence to medication (n=8, 21.6%), smoking cessation (n=11, 29.7%), influenza vaccinations (n=7, 18.9%), pulmonary rehabilitation (n=11, 29.7%) and oxygen therapy (n=2, 5.4%). Outcomes varied widely between studies within a single intervention (*e.g.* initiation, adherence and completion of pulmonary rehabilitation programme). However, most of the included studies suggested the presence of inequalities linked to ethnicity across interventions.

**Conclusion:** This review indicated the presence of poor adherence to nonsurgical interventions among people from minority ethnic backgrounds living with COPD. However, due to the heterogeneity in population groups considered and compared within the individual studies, it is challenging to identify and understand the key inequalities influencing adherence to nonsurgical interventions. Further research is needed to better explore this.

## Introduction

COPD is a condition characterised by airflow obstruction, which eventually leads to respiratory symptoms such as dyspnoea, cough, wheezing and sputum production [1]. According to the World Health Organization, COPD is ranked as the third leading cause of death globally, with reports of more than 3 million deaths worldwide in 2019 [2]. More specifically, in the United Kingdom (UK), 30 000 deaths per year are attributed to COPD [3]. As well as being a cause of mortality, COPD is associated with disability that affects a person's quality of life [4]. This disease exhausts healthcare budgets worldwide and, consequently, creates an indirect economic burden within healthcare systems [5]. In the UK, the National Health Service spends GBP800 million on COPD management, and people with COPD lose ~24 million working days annually [3]. Breathlessness is the most commonly experienced symptom among individuals diagnosed with COPD and leads to panic and anxiety attacks [4]. Additionally, acute exacerbation is a major event of COPD which is associated with an increased risk of dyspnoea and negatively affects health status, increases likelihood of hospitalisation, higher readmission rates and disease progression [1].



According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), in addition to pharmacological treatment, people with COPD benefit greatly from adhering to nonsurgical therapies in terms of lowering the frequency and severity of exacerbations, enhancing health status and raising the quality of life [1]. These include smoking cessation, influenza vaccination, pulmonary rehabilitation and long-term oxygen therapy [1]. It is evident that early cessation of smoking is an essential intervention for COPD to slow down decline in lung function [6, 7]. Infections are responsible for ~70% of disease exacerbations in people diagnosed with COPD, with the influenza virus being identified as the second most common viral cause [8]; therefore, GOLD recommended that all individuals diagnosed with COPD should receive an annual influenza vaccine [1]. Pulmonary rehabilitation is an important component of COPD management, as it has the potential to improve a person's physical and psychological wellbeing [7, 9]. Moreover, long-term oxygen therapy is the gold standard for individuals living with advanced COPD and those who experience hypoxia at rest [10]. Evidence has proved its benefit in terms of prolonging survival, and improving pulmonary haemodynamics as well as neuropsychological health of people living with COPD [1, 10]. Individuals diagnosed with COPD should also be advised about the importance of medication adherence, with emphasis placed on proper inhaler technique [1]. Many factors have been documented to have a potential influence on adherence, including patient (*e.g.* medication knowledge), disease (*e.g.* severity of disease), medication (*e.g.* medication side-effects) and healthcare system related factors (*e.g.* access to care) [11]. Additionally, McQUAID and LANDIER [12] reported that perceived ethnic discrimination, medication beliefs, use of alternative medication including natural products (*e.g.* herbals) or body practices (*e.g.* yoga), and limited English language proficiency are possible key factors that may contribute to the variation of adherence associated with ethnicity. Authors found that these factors may illustrate the disparities in health outcomes between different ethnic groups across several chronic conditions (*e.g.* diabetes, asthma, depression and hypertension) [12]. Evidence has shown that ethnicity is also associated with disparities in the application of nonpharmacological interventions in COPD, including smoking cessation, influenza vaccination and long-term oxygen therapy [13].

Given that COPD-related hospitalisation and death also varied among different ethnic groups [14–16], it is crucial to determine how individuals from different ethnic backgrounds living with COPD adhere to nonsurgical interventions. Understanding how ethnicity influences COPD treatment may help to identify the barriers related to poor adherence to nonsurgical interventions. However, due to the variety of objectives within a single intervention (*e.g.* medication adherence, compliance, persistence; smoking cessation, receiving advice from professionals about smoking cessation, using and utilising of smoking cessation agents; and initiation, adherence, completion of pulmonary programme), as well as the heterogeneity of scales and measures used to evaluate medication adherence. Moreover, a wide variety of ethnic groups were reported as the included studies originated in various countries (*e.g.* United States of America (USA), Denmark, Canada, UK, New Zealand and Australia); results cannot be compared and a scoping review might be a better option. This scoping review aimed 1) to map and illustrate the breadth of the available evidence investigating the inequalities within COPD management between individuals from different minority ethnic communities; and 2) to identify knowledge gaps within the concept of ethnicity influence on adherence to nonsurgical interventions among people with COPD.

## Methods

This scoping review was designed based on the refined frameworks of Arksey and O'Malley, developed by JBI (Joanna Briggs Institute) [17]. An *a priori* protocol specified the objective, inclusion criteria and methods in advance and was registered with the Open Science Framework on 3 February 2023 [18].

### Research question/objective

The objective was to investigate the influence of ethnicity on adherence to nonsurgical interventions among people from minority ethnic communities diagnosed with COPD.

### Inclusion criteria

We used the participant, concept and context protocol by JBI to frame the inclusion criteria.

### Participants

Individuals diagnosed with COPD from minority ethnic communities, irrespective of their age, disease stage and the presence of comorbidities. According to the UK Office of National Statistics [19], the term "ethnic minority individuals" was defined as any population that did not speak the language of the study country, was an immigrant or identified as an ethnic minority.

### Concept

The factors associated with medication adherence, enrolment and persistence with pulmonary rehabilitation, uptake of the influenza vaccine, adherence to long-term oxygen therapy, smoking cessation or receiving assistance and advice to quit smoking among people living with COPD.

### Context

Influence of ethnicity on adherence to nonsurgical interventions among individuals diagnosed with COPD worldwide.

### Types of studies

We only considered primary research in this review. Observational studies, including prospective and retrospective cohort studies, analytical cross-sectional studies, descriptive observational studies and descriptive cross-sectional studies were considered for inclusion. Reviews, conference abstracts, letters and opinions were excluded, as these cannot address the primary question/objective. The search was not limited by any time frame, patient age range or geographical location, but was restricted to studies published in the English language only, based on a lack of available translation services within the scope of this project. Studies were not excluded based on quality.

### Search strategy

An initial, scoping search was developed for MEDLINE (PubMed) and CINAHL to identify relevant articles on the topic. The identified keywords and index terms of the retrieved papers were used to develop the final search strategy. A second search across CINAHL (EBSCO), MEDLINE (Ovid), and Embase (Ovid) was undertaken using all identified keywords and index terms to identify eligible studies. Screening the reference list of the included studies and searching the grey literature (e.g. [www.worldwidescience.org](http://www.worldwidescience.org) and <https://opengrey.eu/>) were undertaken to identify additional relevant articles.

### Source of evidence screening and selection

All identified articles were exported into EndNote 20.4 and duplicates removed. The authors A.K. Husband, H. Nazar and S. Alamer screened titles and abstracts based on the pre-specified inclusion and exclusion criteria. Potentially relevant articles were imported into Rayyan software [20] where they were independently assessed by H. Nazar, A. Robinson-Barella and S. Alamer based on the full text of the selected papers. A.K. Husband was involved to solve any disagreements between reviewers. The Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) guidelines were followed to report this scoping review [21].

### Data extraction

The final data from the eligible studies were extracted to answer the review question according to the method developed by PETERS *et al.* [22]. A refined table template, developed in the protocol, was used for the data extraction. The extracted data included author, year, country, aim(s), study population, methodology and key findings related to the objective of this review.

### Analysis and synthesis

We categorised the influence of ethnicity on adherence to nonsurgical interventions among people living with COPD into five main aspects: medication adherence, smoking cessation, influenza vaccination, pulmonary rehabilitation and long-term oxygen therapy. A narrative synthesis approach was used to present the results and answer the review question. Due to the nature of the scoping review, assessment of article quality is not applicable.

### Reporting of ethnicity data

In this review, we decided to use the term “ethnicity” rather than “race”, unless the authors of the included studies specifically used it. The term “ethnicity” is preferred since it includes cultural and regional characteristics and enables us to consider more confounding factors that can contribute in the variation of adherence to treatment. We defined “ethnicity” according to SENIOR and BHOPAL [23], who state that “ethnicity implies one or more of the following: shared origins or social background; shared culture and traditions that are distinctive, maintained between generations, and lead to a sense of identity and group; and a common language or religious tradition”. It is preferred to use the term “race”, which is one of the main human groupings, and is typically distinguished by physical characteristics such as skin colour to explain racism or other social phenomena [23]. The National Institutes of Health guides were used to report ethnicity data in this review [24].

### Results

Our search strategy retrieved a total of 3679 citations and an additional 11 relevant citations were identified from the manual screening of reference lists and searching grey literature. 32 duplicates were detected and removed. After reviewing the titles and abstracts, 3426 studies were excluded. 232 citations were considered for further full-text assessment. Of these, 195 studies were excluded due to the following reasons: individuals with COPD were not included, ethnicity was not included as a predictor, the paper was published as a conference abstract or written in a language other than English.

A total of 37 citations were eligible for inclusion in this review [3, 25–60]. A PRISMA-ScR flow diagram, reporting the selection process of the included studies, is shown in figure 1.

### Article characteristics

Our search strategy yielded 37 studies that examined the influence of ethnicity on nonsurgical interventions among people diagnosed with COPD. The publication dates of these studies ranged between 2003 and 2022. Included studies were conducted in various countries, but the most common was the USA (n=26, 70.2%) [25, 26, 28, 29, 31, 33–36, 38–40, 42–51, 53, 57, 58, 60], followed by Denmark (n=4, 10.4%) [32, 54–56], New Zealand (n=3, 8.10%) [27, 37, 41] and the UK (n=2, 5.4%) [3, 30]. Two studies were included from Australia and Canada [52, 59]. Based on the type of the intervention, the included studies were distributed as follows: medication adherence (n=8, 21.6%) [28, 32–34, 36, 43, 55, 57], smoking cessation (n=11, 29.7%) [3, 25, 30, 35, 39, 40, 42, 53, 54, 56, 58], influenza vaccination (n=7) [3, 26, 29, 31, 48, 59, 60], pulmonary rehabilitation (n=11, 29.7%) [3, 27, 37, 38, 41, 46, 47, 49–52] and long-term oxygen therapy (n=2, 5.4%) [44, 45]. A list of the included studies, with their characteristics, is presented in table 1.

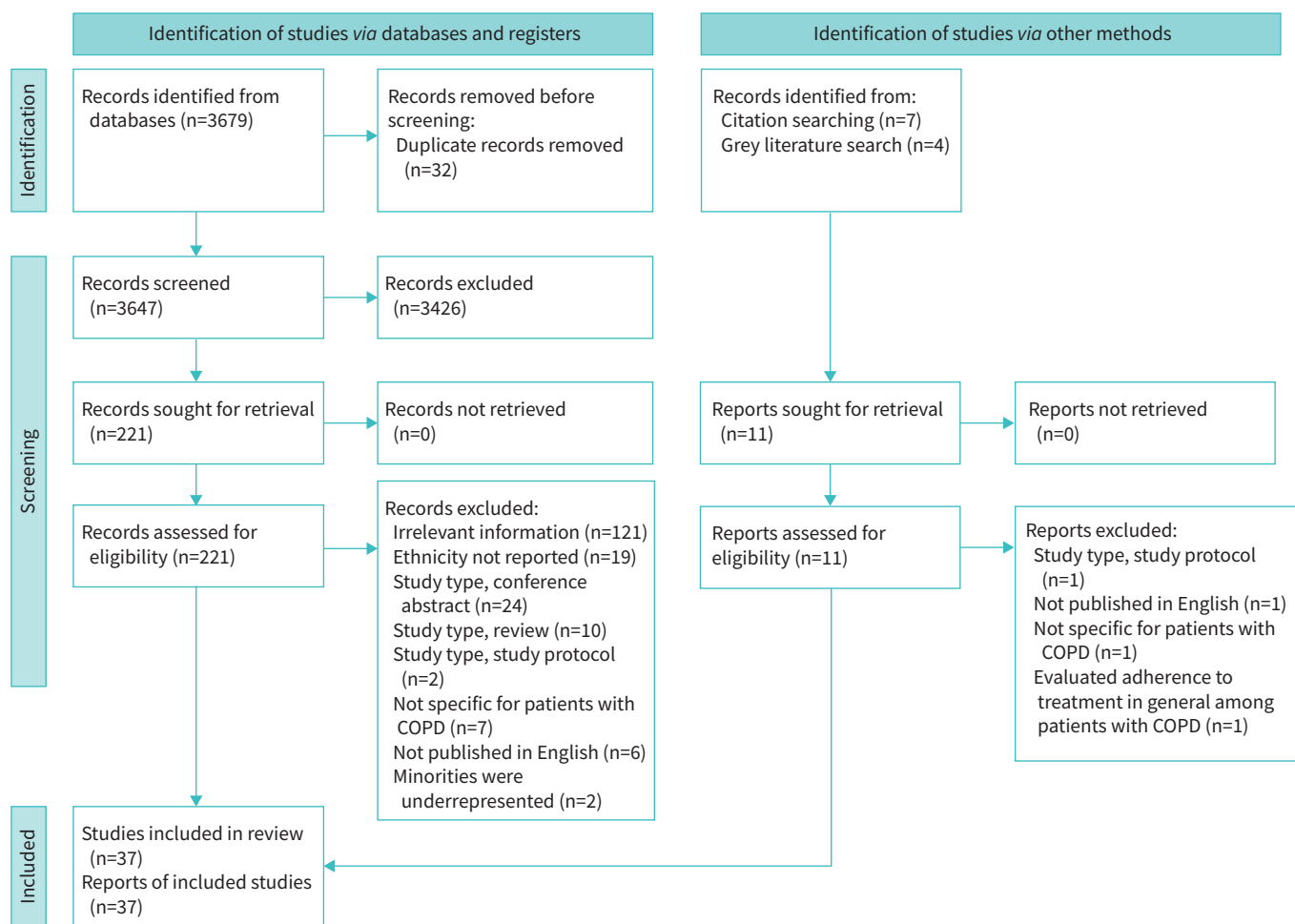


FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart of the studies' selection.

TABLE 1 Characteristics of included studies

First author, year [reference]	Type of intervention	Country	Study design
CECERE, 2012 [28]	Adherence to LABA and ICS	USA	Secondary analysis of a randomised trial
HU, 2017 [32]	Persistence with LABD	Denmark	Cohort study
KRAUSKOPF, 2015 [34]	Medication adherence	USA	Observational study
UNNI, 2021 [57]	Medication adherence	USA	Cross-sectional survey
MELZER, 2017 [43]	Inhaler technique	USA	Cross-sectional study
TØTTENBORG, 2016 [55]	Medication adherence	Denmark	Prospective cohort study
JUNG, 2009 [33]	Medication adherence and persistence	USA	Retrospective cohort study
LE, 2022 [36]	Medication adherence	USA	Retrospective cohort study
GILKES, 2016 [30]	Smoking history	UK	Retrospective cross-sectional study
LIU, 2022 [40]	Smoking cessation	USA	Cross-sectional study
TILERT, 2015 [53]	Receipt of smoking cessation advice	USA	Cross-sectional survey
MELZER, 2016 [42]	Smoking cessation medications	USA	Cohort study
KWAK, 2018 [35]	Smoking cessation medications	USA	Retrospective observational study
VAIDYA, 2014 [58]	Smoking cessation medications	USA	Retrospective study
TØTTENBORG, 2018 [54]	Smoking cessation medications	Denmark	Prospective design
TØTTENBORG, 2016 [56]	Smoking cessation	Denmark	Prospective design
LINDSAY, 2021 [39]	Quit attempt	USA	Cross-sectional study
MARTIN, 2012 [3]	Smoking cessation, influenza vaccination, referral to PR	UK	Cross-sectional study
ADAMS, 2006 [25]	Smoking cessation	USA	Cross-sectional survey
EGEDE, 2003 [29]	Influenza vaccination	USA	Cross-sectional study
VOZORIS, 2009 [59]	Influenza vaccination	Canada	Cross-sectional study
YOUNG-XU, 2022 [60]	Influenza vaccination	USA	Retrospective observational cohort study
Hsu, 2016 [31]	Influenza vaccination	USA	Cross-sectional study
ARABYAT, 2018 [26]	Influenza vaccination	USA	Cross-sectional study
SAEED, 2021 [48]	Influenza vaccination	USA	Cross-sectional study
NISHI, 2016 [46]	Receipt of PR	USA	Retrospective study
OATES, 2017 [47]	Adherence to PR	USA	Cross-sectional analysis
SPITZER, 2020 [49]	Rates of PR participation	USA	Retrospective study
LINDENAUER, 2020 [38]	Initiation of PR	USA	Retrospective cohort study
LEVACK, 2016 [37]	Uptake of PR	New Zealand	Grounded theory methods
STEFAN, 2021 [51]	Initiation of PR	USA	Retrospective cohort study
SPITZER, 2019 [50]	Receipt of PR	USA	Cohort study
TANG, 2022 [52]	Engagement in PR	Australia	Prospective cross-sectional study design
CANDY, 2020 [27]	Attended PR	New Zealand	Retrospective analysis
McNAUGHTON, 2016 [41]	Attended PR	New Zealand	Retrospective cohort study
NISHI, 2015 [45]	Oxygen therapy	USA	Retrospective study
MOY, 2019 [44]	Oxygen initiation and adherence	USA	Secondary analysis of LOTT

LABA: long-acting  $\beta$ -agonist; ICS: inhaled corticosteroids; USA: United States of America; LABD: long-acting bronchodilators; UK: United Kingdom; PR: pulmonary rehabilitation; LOTT: long-term oxygen treatment trial.

### Medication adherence

The included studies evaluated medication adherence among individuals living with COPD using a range of measures. The Medication Adherence Report Scale was employed as a self-reported measure in two studies [34, 57], while five studies were found to use measures based on the electronic database data such as refill compliance, proportion of days covered, medication possession ratio and defined daily doses [28, 32, 33, 36, 55]. The remaining study used placebo inhalers to observe how individuals with COPD utilised the inhalers [43].

Across five studies originating from the USA aiming to examine the relationship between ethnicity and adherence to COPD medication, findings indicated that people from Black and Hispanic ethnic groups were less likely to be adherent to COPD medications compared to those of White ethnicity [28, 33, 34, 36, 57]. The differences in adherence were reported to be significant in four studies [28, 33, 34, 36], while UNNI *et al.* [57] reported insignificant variation in medication adherence among individuals from minority ethnic groups diagnosed with COPD. Two studies in Denmark reported that those from backgrounds other than ethnic Danes had a higher risk of poor adherence to COPD medications [32, 55]. Additionally, people of Black ethnicity living with COPD have higher odds of using their inhalers improperly for almost all devices [43] (supplementary table S1).

### Smoking cessation

In terms of the impact of ethnicity on smoking cessation among people living with COPD, two UK-based studies found that people of Black ethnicity were less likely to be current smokers compared with Whites when they were diagnosed with COPD [3, 30]. Another two studies conducted among Denmark's COPD population were included in this review [54, 56]. TØTTENBORG *et al.* [54] aimed to identify the predictors for using of smoking cessation medication among individuals living with COPD. The results revealed lower odds of utilising smoking cessation medications by people of non-Danish origin compared with native Danes [54]. While the another study by TØTTENBORG *et al.* [56] intended to identify the factors related to quitting smoking in patients from Danish outpatient clinics. The authors found insignificant differences between immigrant and Danish individuals living with COPD in terms of participation in smoking cessation (hazard ratio 1.17, 95% CI 0.79–1.74) [56]. Two American studies reported that people of non-Hispanic White ethnicity living with COPD had a higher rate of successfully quitting smoking compared with other minority ethnic groups [39, 40]. ADAMS *et al.* [25] classified the study sample into three groups: former, intermittent and current smokers. The authors found that significantly more people of African American ethnicity in the intermittent-smoker groups compared to White people and significantly fewer people of Hispanic ethnicity in the current-smoker groups compared with other ethnic groups [25]. The remaining three studies assessed the disparities in use of smoking cessation agents among individuals living with COPD in the USA [35, 42, 58]. MELZER *et al.* [42] document lower odds of receiving treatment for smoking cessation among people of Black ethnicity within 48 h of discharge from hospital following admission for exacerbation of COPD. KWAK *et al.*'s [35] results revealed higher prescription rates among people of Hispanic ethnicity living with COPD and bupropion was found to be the most likely prescribed agent for this group. In contrast, VAIDYA *et al.* [58] showed a lower utilisation of smoking cessation agents by smokers of Hispanic ethnicity diagnosed with COPD in comparison to non-Hispanic groups. Furthermore, in comparison with White people, people of African American ethnicity were less likely to utilise smoking cessation agents [58]. Interestingly, a USA-based study reported a significant difference in receiving advice to quit smoking from a physician based on ethnicity ( $p=0.033$ ) [53] (supplementary table S2).

### Influenza vaccine

The majority of the studies about influenza vaccination uptake included were conducted in the USA [26, 29, 31, 48, 60]. All of these studies concluded that being of Black ethnicity is a predisposing factor for the lower likelihood of receiving influenza vaccine compared to the White COPD population [26, 29, 31, 48, 60]. MARTIN *et al.* [3] found that people of South Asian ethnicity were more likely to receive the influenza vaccine compared to people of White and Black ethnicities living with COPD in London. Another study aimed to identify sociodemographic factors associated with low uptake among Canadian individuals diagnosed with COPD [59]. The results showed an insignificant difference between Caucasian (White ethnicity) and those from minority communities in receiving the influenza vaccine [59] (supplementary table S3).

### Pulmonary rehabilitation

Six out of 11 pulmonary rehabilitation related studies were conducted in the USA [38, 46, 47, 49–51]. The authors of these studies confirmed that people of non-Hispanic White ethnicity with COPD were more likely to receive, initiate and adhere to pulmonary rehabilitation [38, 46, 49–51]. Conversely, OATES *et al.* [47] found that White ethnicity was predictive of low adherence to pulmonary rehabilitation compared with Black people diagnosed with COPD. In London, White people diagnosed with COPD were found to be more likely to receive pulmonary rehabilitation compared with those of South Asian and Black ethnicities [3]. Results of an Australian study revealed insignificant differences in the referral, attendance and completion of pulmonary rehabilitation between culturally and linguistically diverse (CALD) and non-CALD groups [52]. However, individuals living with COPD from CALD backgrounds were found to have lower awareness of pulmonary rehabilitation compared with non-CALD individuals [52]. Two more studies conducted in New Zealand identified a significantly lower session attendance among Māori and Pacific Island people diagnosed with COPD compared to those of European origin [27, 41] (supplementary table S4).

### Long-term oxygen therapy

Both of the retrieved studies that investigated the influence of ethnicity on adherence to long-term oxygen therapy among individuals diagnosed with COPD were based in the USA. NISHI *et al.* [45] examined the impact of patient characteristics on adherence to long-term oxygen therapy use among people living with COPD, they found that the population of non-Hispanic White ethnicity was associated with higher odds of receiving oxygen therapy compared with Black and other ethnic groups [45]. In contrast, Moy *et al.* [44] prescribed the study sample either continuous or intermittent oxygen therapy, and they assessed adherence over short (0–30 days), medium (9–19 months) and long (month 13 to last follow-up) intervals. The results showed no statistical difference between people living with COPD of White ethnicity and those of other ethnicities in both groups among the three intervals [44] (supplementary table S5).

### Discussion

To our knowledge, this is the first scoping review that has aimed to examine the impact of ethnicity-related differences on nonsurgical interventions among individuals living with COPD.

Most of the studies included in this review suggest the presence of disparities in the management of COPD based on ethnicity. Given that nonsurgical interventions are the gold standard for managing and improving COPD outcomes, our findings may assist to demonstrate the influence of ethnicity on the severity of COPD-related disability and the mortality rate of COPD.

All of the included studies demonstrated a significant difference in adherence to medication among individuals living with COPD based on ethnicity [28, 32–34, 36, 43, 55], except the study by UNNI *et al.* [57]. Smoking cessation as well as uptake of the influenza vaccine, which play vital roles in the management of COPD, were found to be significantly influenced by ethnicity across all of the included studies in this review. In several study settings, disparities in pulmonary rehabilitation engagement by ethnicity were also reported [3, 27, 37, 38, 41, 46, 47, 49–52], while only one study found a significant association between ethnicity and receiving oxygen therapy among people with COPD [45]. In addition to ethnicity, authors of the included studies reported other possible determinants of nonadherence such as low income, low level of education, severity of the disease, presence of comorbidities, absence of insurance, young age, living alone or miscommunication due to language barriers. Most of these factors are commonly reported within minority communities, which may contribute to the variation in adherence by ethnicity [54]. However, the influence of ethnicity persisted in most studies despite the controlling of various confounders (*e.g.* socioeconomic status, education level) attributing the association between ethnicity and adherence to non-surgical interventions of COPD management.

A systematic review by ŚWIĄTONIOWSKA *et al.* [61] emphasised that sociodemographic (*e.g.* income), psychological (*e.g.* depression, cultural beliefs) and clinical factors (*e.g.* disease stage, comorbidities) were the most common factors that negatively affect adherence to medication among people living with COPD. Additionally, BREHM and CELEDÓN [62] reported that cultural beliefs and misconceptions about smoking may influence motivation to quit smoking. Work by SCHMID *et al.* [63] concurs with our findings in terms of variation in uptake of the influenza vaccine by ethnicity. The authors speculated that a lack of access to healthcare, physician discrimination and medical mistrust may all contribute to low vaccination rates among minority communities [63]. However, SCHMID *et al.* [63] noted that further research is needed to fully understand this behaviour because ethnicity may only serve as a carrier variable of explanatory factors that actually affect vaccine hesitancy. CRINER *et al.* [64] supported our findings and reported the potential reasons for the underutilisation of pulmonary rehabilitation programmes among minority communities living with COPD. These include a lack of awareness or trust in the benefits of pulmonary rehabilitation, frequent hospitalisation and emergency department visits, limited transportation and poor communication with medical professionals [64]. Therefore, further work is needed to evaluate individuals' lived experiences and adherence behaviour to address ethnicity-related factors that may account for the variance in the management of COPD. In consequence, providing individualised recommendations to encourage and incentivise engagement in nonsurgical interventions may enhance the health status and quality of life among people living with COPD despite their ethnic background and potentially have a positive impact on reducing the economic burden of the disease within healthcare systems.

### Strengths and limitations

To conduct the review with the required rigour and transparency, comprehensive searching, screening and reporting frameworks (JBI and PRISMA-ScR) were followed. We were able to extract some relevant data from studies that were not specifically designed to evaluate the impact of ethnicity, but did report relevant outcomes by ethnic minority groupings. We used broad inclusion criteria, and this allowed us to identify knowledge gaps in the disparities of COPD management according to ethnic differences. This review is

limited to papers published in English only, thus leaving out potentially important information from relevant papers written in other languages.

It is critical to acknowledge the heterogeneity across included studies in terms of settings, which consequently leads to discrepancies in reporting the data about ethnicity and inclusion of a broad range of ethnic groups (e.g. Hispanic/White non-Hispanic, South Asian, Māori, Europeans, native/non-native, ethnic Danes). Moreover, several concepts to define adherence to smoking cessation, pulmonary rehabilitation, and uptake of the influenza vaccine as well as numerous tools to measure medication adherence and access to pulmonary rehabilitation were used across included studies. Taken together, this makes the process of interpreting key findings challenging, and impossible to determine key priorities for the most influential outcomes. The observational nature of the study design was considered a limitation by the authors of the included studies due to the inability to assess causal relationships from the results [25, 26, 31, 40, 42, 48, 53, 58, 59]. In addition, there was a probability of recall bias and social desirability bias because several of the included studies used self-reported measures of adherence [26, 31, 39, 40, 42, 48, 56, 58, 59].

### Conclusion

The results of the review showed that different ethnic groups had different levels of adherence to nonsurgical interventions for COPD. These differences persisted in some studies despite adjusting for possible confounders (such as sociodemographic factors). Therefore, the barriers and facilitators of adherence to nonsurgical interventions among minority ethnic people living with COPD need to be better understood through additional future research. Identifying patient-related factors of this variation will help to develop tailored protocols and strategies for optimising treatment and improving disease outcomes of individuals diagnosed with COPD regardless of their ethnic background.

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