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Review Article **Cardiology**

Systematic Review about Chronic Obstructive Pulmonary Diseases in Saudi Arabia

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Abstract

Background: Chronic obstructive pulmonary disease is one of the most common non-communicable illnesses, having the potential to be fatal, it is now the third leading cause of death worldwide. ***Objectives:*** The aim of our study was to estimate the prevalence of COPD, its associated risk factors, causes and management in Saudi Arabia. ***Methods:*** For article selection, the PubMed database and EBSCO Information Services were used. All relevant articles relevant with our topic and other articles were used in our review. Other articles that were not related to this field were excluded. The data was extracted in a specific format that was reviewed by the group members. ***Conclusion:*** In Saudi Arabia, the prevalence estimated of COPD is relatively high, moreover it increases by time. High prevalence of smoking and increased age was reported to be the most common effective risk factors of COPD in Saudi population. COPD is now considered a preventable and potentially treatable disease if detected in the early stages. Avoidance of exposure to harmful particles, mainly smoking, can prevent progression to a clinically significant stage of the disease.

Keywords: Chronic obstructive pulmonary disease, mortality rates, acute respiratory failure, risk factor, smoking, Saudi Arabia.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the most common non-communicable illnesses, having the potential to be fatal. COPD is now the third leading cause of death worldwide, and it is likely to rise to the top of the list during the next decade. [1] COPD is a prevalent, manageable, and curable condition, according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD). There were an estimated 455 million cases of COPD and 3.9 million deaths worldwide in 2019. [1] COPD is a severe public health issue that has a negative financial impact. The global cost of COPD in 2010 was $2.1 trillion, and it is expected to rise to $4.8 trillion by 2030. [1] Because COPD remains underdiagnosed, this is a conservative estimate. Furthermore, the vast list of comorbidities associated with COPD, such as cardiovascular disease, lung cancer, and mental health, would create an additional load on the healthcare system. COPD is characterized by airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Symptoms can range from being asymptomatic to respiratory failure. [2]

COPD is still underdiagnosed and underestimated throughout the Middle East, notably in the Gulf Cooperation Council countries. According to World meter statistics, Saudi Arabia is the largest nation in the Middle East area, with a population of 35.6 million people as of 2022. According to the BREATH study done in MENA nations. [1] Prolonged exposure to hazardous chemicals or particles results in COPD. There is many risk factors for COPD including genetic factors, family history, type of work, smoking, sex and age. The most common cause of COPD worldwide is cigarette smoking. Other factors may include exposure to secondhand smoke, the environment, occupational hazards, and a lack of alpha-1 antitrypsin (AATD). [2]

The symptoms of COPD often appear in maturity, frequently in the winter. Patients typically complain of chronic and deteriorating dyspnea, coughing, and sputum production. Additionally, wheezing and chest tightness are possible in patients. Although smoking history is present in the majority of cases, many people lack it. They need to be questioned about their family history, occupational and environmental exposures, and exposure to secondhand smoke. People with a confirmed diagnosis of COPD should be questioned regarding past exacerbations, nightly awakenings, inhaler use, and how the condition affects their level of activity. Patients should be questioned about their prior medical history for conditions such asthma, allergies, and childhood respiratory infections. [3] Several studies undertaken in Saudi Arabia over the last three decades show that smoking is on the rise, particularly among young men and women. Successful symptom management for chronic diseases is dependent on a variety of factors, including patient adherence to the suggested treatment plan. However, studies indicate that many patients with chronic diseases do not take their medications as directed. Pulmonary function testing (PFT) is essential in the diagnosis, staging, and monitoring of COPD. [3] Spirometry is performed before and after administering an inhaled bronchodilator. Inhaled bronchodilators may be a short-acting beta2-agonist (SABA), short-acting anticholinergic, or a combination of both. Treatment of COPD depends mainly on controlling the symptoms, however, some cases may need IC admission.

OBJECTIVES

The aim of our study was to estimate the prevalence of COPD, its associated risk factors, causes and management in Saudi Arabia.

METHODOLOGY:

This systematic review was conducted following the demonstrated guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, PRISMA).

Study design: This was a systematic review.
Study duration: From 1st July to 31st September, 2022.
Study condition: This review investigates the previously published literature discussing the prevalence of COPD, its associated risk factors, causes and management in Saudi Arabia.

Search strategy

A systematic literature search of five major databases, including PubMed, Web of Science, Science Direct, EBSCO, and Cochrane library, was conducted to include the eligible literature. Our search was limited to the English language and was adjusted for each database as required. The eligible studies were determined through the following keywords that were adjusted into Mesh terms in PubMed; "the prevalence of COPD, its associated risk factors, causes and management in Saudi Arabia." The appropriate keywords were paired with "OR" and "AND" Boolean operators. The search results comprised English, full-text publications, freely available articles, and human trials.

Selection criteria:

Our review comprised the studies with the following criteria:

- Mainly cohort and retrospective cohort studies and study designs that provided qualitative or quantitative data about COPD prevalence, risk factors and management in Saudi Arabia.

Exclusion criteria included the following:

- Studies not conducted in the English language.
- Studies with no free access.

Data extraction

We used Rayyan (QCRI) [9] to detect the duplicate aspects of the search strategy outcomes. The researchers evaluated the titles and abstracts for suitability by screening the pooled search results using a set of inclusion/exclusion criteria. The reviewers assessed the whole texts of the papers that satisfied the requirements for inclusion. The authors engaged ins discussion to settle any disagreements. To include the eligible study, a data extraction form was created. The authors extracted data about the study titles, authors, study year, study design, study population, participant number, objectives, the complication discussed and the key findings.

Risk of bias assessment

ROBINS-I tool for non-randomized studies [16] was used for qualitative data synthesis to assess the included research quality. The reviewers investigated any inconsistencies in the quality assessment and addressed them.

Strategy for data synthesis

To provide a qualitative overview of the included research aspects and outcome data, summary tables were presented, including the collected details from the eligible studies. After finishing the data extraction in this systematic review, decisions were made on how to maximize the use of the available data of the included study articles. Studies that met the full-text inclusion requirements but did not provide any data on the awareness level were excluded.

RESULTS

Search results:

A total of 87 study articles were extracted from the systematic search, and then 44 duplicates were removed. Title and abstract screening were conducted on 25 studies, and 20 studies were excluded. One hundred twenty two reports were sought for retrieval, and only 30 articles were not retrieved. Finally, 92 studies were screened for full-text assessment; 20 studies were excluded for wrong study outcomes, 38 studies were excluded for unavailable data on the current topic, and 43 were excluded for the wrong population type. seven

eligible study articles were included in this systematic review.

Characteristics of the included studies:

A total of 7 studies were included in this review. The main topic of most of these studies was ranging from the prevalence of COPD, its associated risk factors, causes and management in Saudi Arabia. Sex studies had a cross-sectional design, [4, 5, 6, 7, 9, 10] while only one had a retrospective cohort design. [8] The sample size of the studies varied from 119 to 784 individuals. Different age groups were studied including elderly, adults and adolescents. All of the included studies were done in Saudi Arabia.

In table (1) we included the summary of the included previous studies with their main objectives, key findings and the year of puplication.

Study	Study design	Location	Sample	Prevalence of COPD	Study Objective	Key findings
M Al Ghobain, *et al*., 2015 [4]	Cross sectional study	Riyadh	784	Total: 4.2% men: 5.7% Women: 2.5%	To estimate the prevalence and associated risk factors of chronic obstructive pulmonary disease (COPD) in Saudi adults aged ⩾40 years using standardised post-bronchodilator spirometry according to the Burden of Obstructive Lung Disease (BOLD) protocol.	The overall prevalence of COPD in Saudi Arabia is 4.2%. Male, increasing age and smoking were the main risk factors for COPD.
Jaber S. Alqahtani, *et al*., 2022 [5]	Cross sectional study	Saudi Arabian		:2019 434,560.64 :1990 101,104.05	examines and tracks the trends of the COPD burden in Saudi Arabia from 1990 to 2019 using the dataset of the Global Burden of Disease (GBD) 2019.	Over the period 1990–2019, the prevalence and incidence of COPD in Saudi Arabia have been steadily rising. Even though COPD morbidity and death rates have been decreasing, they remain higher in men and older age.
Basem M M Salama, *et al*., 2020 [6]	case-control study	Arar City, Northern Border Province, Saudi Arabia	314	50%	to identify risk factors associated with Chronic Obstructive Pulmonary Disease among adults.	The results of this study showed that amount and duration of smoking not just smoking alone were important risk .factors of COPD
Siraj O. Wali, *et al*., 2014 [7]	cross-sectional,	Saudi Arabian		2.4%	To assess the prevalence of epidemiologically defined chronic obstructive pulmonary disease (COPD) in Saudi Arabia	The prevalence of epidemiologically defined COPD in the general population of Saudi Arabia is 2.4%, which is lower than that reported in industrialized countries.
Abdulsalam M Alaithan, *et al*., 2012[8]	retrospective cohort	Saudi Arabia	119	100%	to measure the in-hospital and intensive care unit (ICU) outcomes of patients admitted with COPD exacerbation, and	Early ICU and hospital mortality is low for COPD patients who have been admitted to the ICU with

					identified the related prognostic factors.	exacerbation. Low Glasgow Coma Scale scores on admission, intubation, prolonged use of mechanical ventilation, and the development of acute renal failure were identified as risk factors associated with increased hospital mortality.
Mohammed Al Ghobain, *et al*., 2011 [9]	cross-sectional	Saudi Arabia	501	29 (22%)	to estimate the prevalence of COPD among smokers more than 40 years of age attending primary healthcare clinics in Saudi Arabia.	Underdiagnosis of COPD in primary healthcare clinics in Saudi Arabia is common, but its extent is not different from the corresponding data available in the literature for other countries. Use of spirometry as a routine test for all patients older than 40 years of age and with a smoking history can help in early detection and proper diagnosis of COPD, which subsequently will help in implementation of preventive measures.
M.Døssing, *et al*., 1994[10]	case-control	Saudi Arabia	121	41.3%	to reveal possible risk factors for COPD.	found no difference in the use of incense burners between cases and controls. On the other hand, two-thirds of the COPD-women and only 1/20 of the control women had been exposed to indoor open fire for more than 20 yr (P<0·05).

DISCUSSION

Based on the previously estimated data regarding chronic obstructive pulmonary disease (COPD) its prevalence, risk factors and management in Saudi Arabia, limited data are available. However, it is believed that cases of COPD are under-diagnosed, but later detected at an advanced stage. [11] The few studies that have investigated the prevalence of COPD in Saudi Arabia have reported a comparable prevalence to other developed countries. [12, 13, 14] In the general Saudi adult population the reported prevalence ranges between 2.4% and 4.2% [14] and is expected to increase further due to the relatively high number of people in Saudi Arabia who smoke (27.9% of the Saudi population aged >40 years). [12]

Mohammed Al Ghobain. *et al*. [4] estimated an overall prevalence of GOLD COPD was 4.2% (men 5.7%, women 2.5%). The overall prevalence of COPD stage 1 or higher using the LLN was lower than estimates using the GOLD criteria (3.2%). The overall prevalence of GOLD stage 2 or higher COPD was 3.7%. Siraj O. Wali. *Et al*. [7] estimated the prevalence of COPD was only 2.4% according to the epidemiological definition of COPD used, which is lower than the prevalence reported by local and international studies

[15, 16]. In another study by Jaber S. Alqahtani [5], investigate the COPD burden in Saudi Arabia using the GBD database, they estimated Saudi Arabia's rate of COPD prevalence in 2019 was 2,053.04 (1,918.06–2,194.29) cases per 100,000, demonstrating an increase of 49% compared to 1990. This increased prevalence of COPD in Saudi Arabia can be explained by the increased rate of smoking among adults, the use of water pipes, biomass fuel exposure, outdoor air pollution and the increasing age of the population [17]. Several studies undertaken in Saudi Arabia over the last three decades show that smoking is on the rise, particularly among young men and women. According to a representative 2013 survey, the total prevalence of smoking was 12.2%, and males were more likely to smoke than women (21.5% vs. 1.1%). Many other previous studies estimated that age, sex and smoking are the most common risk factors for COPD. [18] Mohammed Al Ghobain. *Et al*. [4] reported male sex, increasing age and smoking as risk factors for COPD, as these items were significantly associated with COPD diagnosis. This was similar to the results reported by Basem M M Salama. *Et al*. [6], in their case control study, who found a significant difference with regard to age, duration of smoking, and the amount of smoking between the study group and controls. This was consistent with most of the studies in Asia and Saudi Arabia. [19, 20, 21] Basem M M Salama. *Et al*. [6] found a significant difference related to age in our study group compared to the control group, with male dominance, as male and female ratio was (57% and 43% respectively). This is consistent with many studies worldwide [22, 23]. Recently, Al Ghobain et –al. [9], reported that the prevalence of COPD among smokers >40 years of age and attending a primary healthcare clinic in Saudi Arabia was 14.2%. Similer results optained by M.Døssing. *et al*. [10]. Genetic factors and family history were also reported as a risk factors to COPD previously [24]. Furthermore, many Saudis have a history of TB, recurrent asthma, and respiratory-tract infections since childhood, all of which are considered risk factors for COPD. Furthermore, non-smoking factors such as biomass fuel, dusts, gases, and outdoor air pollution are often contributing to Saudi Arabia's growing incidence of COPD. This is consistent with the finding of Basem M M Salama. *Et al*. [6]. As a result of increasing population aging, incidence, morbidity and mortality are increased, highlighting the importance of early COPD screening and diagnosis [25]. It has been reported that early ICU and hospital mortality is low for COPD patients who have been admitted to the ICU with exacerbation. Low Glasgow Coma Scale scores on admission, intubation, prolonged use of mechanical ventilation, and the development of acute renal failure were identified as risk factors associated with increased hospital mortality. Abdulsalam M Alaithan. *Et al*. [8] found that the ICU mortality was 6%, and hospital mortality was 11%, however, the overall hospital mortality was lower than mortality rates reported in other studies [26, 27]. This could be because the continuous observation for the patient and the early use of noninvasive mechanical ventilation was associated with a high success rate (84%). Jaber S. Alqahtani. Et aal. [5] found a mild reduction in the mortality rates attributed to COPD reduced to 1.65% in 2019 compared to 1990 (1.74%), however, these rates were higher among Saudi males than females. As the Saudi Arabian COPD population becomes older, the rates of morbidity and death progressively rise. According to the WHO, Saudi Arabia is ranked 26 of 190 countries in terms of the quality of the health-care system. [28] However, the total number of patients who visited emergency departments and chest diseases clinics in public hospitals, and the number of people who died due to respiratory diseases have increased noticeably over the past 4 years. Whereas, this may be explained by increasing numbers of people with respiratory diseases, [29, 30]. More efforts should be done in modification of IC units, hospitalization level and health care providers in order to decrease mortality rates.

CONCLUSION

In Saudi Arabia, the prevalence estimated of COPD is relatively high, moreover it increases by time. High prevalence of smoking and increased age was reported to be the most common effective risk factors of COPD in Saudi population.

COPD is now considered a preventable and potentially treatable disease if detected in the early stages. Avoidance of exposure to harmful particles, mainly smoking, can prevent progression to a clinically significant stage of the disease.

Limitations:

The inclusion of a descriptive and cross-sectional study into one meta-analysis may introduce heterogeneity into the results; this weakness was covered by using a random effect. Also lack of access to some of published or unpublished articles could be considered as the limitations of the study.

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