ORIGINAL ARTICLE

Prevalence of Chronic Non-Communicable Respiratory Diseases in Mosul City

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ABSTRACT

Introduction: Chronic non-communicable respiratory diseases (CNCRDs) encompass a group of conditions affecting the airways and lung structures, including Chronic Obstructive Pulmonary Disease (COPD), emphysema, allergic rhinitis, asthma, pulmonary arterial hypertension, and cystic fibrosis. CNCRDs pose a significant global health challenge, resulting in approximately four million deaths annually. This study aimed to identify the prevalence and risk factors associated with CNCRDs and measure trends in the prevalence of these risk factors over time. **Methods:** A cross-sectional epidemiological study was conducted using data collected from primary health centers on both sides of Mosul City. The study period extended from January 1 to July 31, 2022, with information obtained from (40) primary health centers, consisting of (20) centers on the right side and (20) centers on the left side of Mosul. **Results:** In 2021, the City of Mosul recorded a total of 13,005 registered cases, with 5,598 cases being attributed to asthma (43%), and 7,347 cases being associated with COPD (57%). Bronchial asthma constituted 43% of cases, with 5598 patients, and the highest incidence occurred in the age group between 20-44 years. **Conclusion:** The prevalence of bronchial asthma and COPD among patients with CNCRDs in Mosul is alarmingly high. It emphasizes the importance of implementing preventive policies and strategies targeting modifiable risk factors for these respiratory conditions.
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Keywords: Chronic non-communicable respiratory diseases, bronchial asthma, prevalence, risk factors, epidemiological study

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INTRODUCTION

Chronic non-communicable respiratory diseases (CNCRDs) encompass a range of conditions affecting the airways and lung structures, such as Chronic Obstructive Pulmonary Disease (COPD), emphysema, allergic rhinitis, asthma, pulmonary arterial hypertension, and cystic fibrosis with pulmonary symptoms (1, 2). Unlike communicable diseases, CNCRDs cannot be spread among people (3, 4). The prevalence of CNCRDs is on the rise globally, both in developed and developing countries. In developing nations, factors like poverty, pollution, and limited access to healthcare resources contribute to the higher prevalence of these diseases (5, 6).

Among CNCRDs, COPD and asthma are significant contributors. Smoking-related COPD is characterized by a gradual loss of airflow, often triggered by an allergic reaction in the lungs to irritating particles or gases like those found in cigarette smoke (7). COPD patients are also at increased risk of lung cancer and cardiovascular disease due to systemic inflammation (8, 9). Asthma development involves environmental and genetic factors, resulting in hyper-responsiveness of the airways and bronchial tube narrowing. Medications like bronchodilators and steroids help alleviate symptoms such as chest tightness, coughing, and shortness of breath (8).

Non-communicable diseases (NCDs) have a significant impact on global mortality, with CNCRDs like asthma and COPD being major contributors. In high-risk occupations like mining and construction, respiratory conditions are common, leading to a considerable number of deaths(10). Workers in the pharmaceutical industry may be exposed to substances that can affect their respiratory health, leading to allergies and sensitization to certain chemicals (11).

In resource-poor countries, the lack of effective air pollution reduction strategies can expose individuals to toxic substances, contributing to the prevalence of chronic respiratory diseases (12). The limited access to proper healthcare in rural areas can lead to

underdiagnosis and delays in treatment, impacting patients' quality of life and exacerbating their symptoms (13).

CNCRDs significantly affect patient outcomes, hindering their ability to function and impacting their psychosocial well-being. Patients may experience various physical and emotional symptoms, and comorbid conditions like depression can further complicate treatment adherence and prognosis (14).

Taking an integrated approach to patient care and management is essential for improving outcomes in CNCRD patients. This approach should consider the interconnected factors influencing their health and treatment, leading to better overall care and improved survival rates. Understanding the factors contributing to the prevalence of CNCRDs and implementing targeted preventive measures and proper management strategies are crucial steps in addressing the growing burden of these chronic respiratory conditions (1).

Despite the increasing global burden of non-communicable chronic respiratory diseases (CNCRDs), there is limited specific research focusing on the prevalence of these conditions in Mosul city. The existing literature primarily emphasizes CNCRD prevalence at the national or regional levels, neglecting city-level data. Mosul, being a significant urban center in Iraq, may have unique risk factors and environmental exposures that could influence the prevalence of CNCRDs among its population. As such, there is a notable gap in the understanding of CNCRD prevalence and associated risk factors at the city level, which warrants further investigation.

The aim of this research is to assess the prevalence of non-communicable chronic respiratory diseases (CNCRDs) in Mosul city, specifically focusing on diseases such as asthma and Chronic Obstructive Pulmonary Disease (COPD). The study aims to provide city-specific data on the prevalence of these respiratory conditions, as well as investigate the associated risk factors contributing to their occurrence among the population.

MATERIALS AND METHODS

Study Design

This study employed a retrospective descriptive design, conducted in 2021, with the aim of fulfilling the research objectives from January 1st, 2021, to December 31st, 2021. The design was chosen as it aligns with the study's objectives, which are to describe the prevalence of chronic non-communicable respiratory diseases and their associated risk factors among patients attending primary health care centers in Mosul City.

Study Setting

The study was conducted in Mosul city, which is situated at latitude 36.34′ North and longitude 43.13 East, covering an area of 180 km2. The city comprises 132 districts, with 55 located on the right side and 77 on the left side. The estimated population of Mosul city is 1,800,000. Data were collected from 40 primary health care centers: 20 from the right side and 20 from the left side of Mosul City.

Sample of the Study and Sampling Technique

The study targeted patients diagnosed with chronic non-communicable respiratory diseases in Mosul City. The sample included 7,347 patients with chronic obstructive pulmonary disease (COPD) and 5,598 patients with asthma. A non-probability sampling technique was used, employing purposive selection based on the inclusion and exclusion criteria.

Inclusion Criteria

Patients with a Confirmed Diagnosis of Asthma

Inclusion criteria for this study encompass individuals with a confirmed diagnosis of asthma, as documented by a qualified healthcare professional. The diagnostic process should involve a comprehensive clinical evaluation, considering recurrent symptoms such as wheezing, coughing, and shortness of breath. Furthermore, confirmation of asthma must be supported by objective evidence, which may include pulmonary function tests like spirometry. Specifically, reversible airflow obstruction and/or bronchodilator responsiveness demonstrated in these tests will be key indicators for eligibility.

Patients with a Confirmed Diagnosis of COPD

Participants must possess a confirmed diagnosis of Chronic Obstructive Pulmonary Disease (COPD), as documented by a qualified healthcare professional. The diagnosis should be established through a thorough clinical evaluation, considering prevalent symptoms such as chronic cough, sputum production, and progressive dyspnea. Additionally, confirmation of COPD requires objective evidence, with pulmonary function tests, specifically spirometry, serving as a crucial diagnostic tool. Persistent airflow limitation, as demonstrated by spirometry, and its non-complete reversibility with bronchodilators are also essential criteria for inclusion.

Location of Diagnosis

Patients must have been diagnosed with asthma or COPD at primary healthcare centers within Mosul City during the specified study period.

Age Range

Patients within a defined age range (e.g., adults aged 18-75 years) to ensure relevance to the study population.

Exclusion Criteria

Patients under the age of 18 years and pregnant women were excluded from the study.

Data Collection Tools

A standardized information sheet was designed to collect data on patients with chronic non-communicable respiratory diseases. The information sheet included demographic details such as name, gender, and age, and relevant medical information related to the patient's chronic non-communicable respiratory diseases.

Data Collection Method

The data for this study were collected through the retrospective review of medical records maintained at primary healthcare centers (PHCs) located within Mosul City.

Statistical Analysis

The collected data was analyzed using SPSS software version 26. Descriptive statistics, such as percentages, odds ratios, p-values, crude estimates, and adjusted estimates, were computed to examine the relationships between study variables.

Ethical Approval

The research study was approved by the scientific committee of postgraduate studies in the College of Nursing, University of Mosul. Additionally, ethical approvals were obtained from the Collegiate Committee for Medical Research Ethics and the Ethical Research Committee in Nineveh Health Directorate. To protect patient identities, the study may have anonymized data, replacing personal identifiers with unique codes or other methods to prevent individuals from being identified.

RESULTS

Table I presents the total number of registered cases in the City of Mosul in 2021, showing that there were 5,598 cases of asthma (43%) and 7,347 cases of COPD (57%).

Table II summarizes the distribution of asthma and COPD cases based on different exposures. In terms of gender, 53% of asthma cases were male, while 45% were female. For COPD, 45% of cases were male, and 55% were female. Regarding age, 28% of asthma cases were in individuals under 18 years old, and 72% were in those above 18 years. For COPD, 47% of cases were in individuals under 18 years, and 53% were in those above 18 years. In terms of residency, 44% of asthma cases and 28% of COPD cases were in rural areas, while 56% of asthma cases and 72% of COPD cases were in urban areas. Moreover, 21% of asthma cases and 17% of COPD cases were smokers, and the majority were non-smokers (79% for asthma and 83% for COPD). Additionally, family history played a role, with 56% of asthma cases and 15% of COPD cases having a family history of asthma. Exposure to gases and dust was reported by 35% of asthma cases and 44% of COPD cases.

Table I: the total number of registry's case in City of Mosul 2021

Diseases	No	%
Asthma	5598	43
COPD	7347	57
Total	12945	100

Table II: Summary of Asthma and COPD Cases in City of Mosul, 2021

Exposure	Asthma Cases (Total: 5598)	COPD Cases (Total: 7347)
Gender		
Male	2952 (53%)	3313 (45%)
Female	2646 (47%)	4034 (55%)
Age		
Less than 18 years	1551 (28%)	3486 (47%)
More than 18 years	4047 (72%)	3861 (53%)
Residency		
Rural	2446 (44%)	2035 (28%)
Urban	3152 (56%)	5312 (72%)
Smoking		
Non-Smoker	1200 (21%)	1216 (17%)
Smoker	4398 (79%)	6131 (83%)
Family History		
Yes	3118 (56%)	1116 (15%)
No	2480 (44%)	6231 (85%)
Exposure to GDF		
Yes	1970 (35%)	3240 (44%)
No	3628 (65%)	4107 (56%)

Table III presents the risk factors associated with asthma. The adjusted estimates show that age above 18 years (OR 2.41), history of/passive smoking (OR 3.79), family history of asthma (OR 2.64), exposure to gases and dust (OR 2.57), and urban residency (OR 2.22) were significantly associated with an increased risk of asthma.

Table IV presents the risk factors associated with COPD. The adjusted estimates show that age above 18 years (OR 2.41), history of/passive smoking (OR 3.26), family history of asthma (OR 2.90), exposure to biomass (OR 2.04), and rural residency (OR 2.41) were significantly associated with an increased risk of COPD.

DISCUSSION

The findings of this study provide valuable insights into the prevalence and risk factors associated with chronic non-communicable respiratory diseases, specifically asthma and chronic obstructive pulmonary disease (COPD), in the City of Mosul in 2021. The results show that asthma and COPD cases accounted for 43% and 57% of the total registered cases, respectively, indicating that these respiratory conditions constitute a significant burden on the healthcare system in the city.

Chronic respiratory diseases pose a significant challenge

Table III: Risk Factors associated with asthma

Factors	(%)	Crude estimates	p-value	Adjusted estimates	p-value
		Odds Ratio (95% CI)		Odds Ratio (95% CI)	
Sex					
Female	(52.7)	1.21 (0.77–1.40)	0.374	1.23 (0.84–1.51)	0.177
Male	(47.3)	1		1	
Age					
>18	27.7	6.48 (4.76–8.82)	<0.001	2.41 (1.66–3.50)	<0.001
<18	72.3	1		1	
History of /passive smoking					
Yes	(21.4)	2.65 (1.45–3.99)	<0.001	3.79 (1.88–5.11)	<0.001
No	(78.6)	1		1	
Family history of asthma					
Yes	(55.7)	3.38 (2.99–4.11)	<0.001	2.64 (1.59–4.65)	<0.001
No	(44.3)	1		1	
Exposure to GDF †					
Yes	(35)	3.47 (2.55–4.28)	0.001	2.57 (1.38–3.55)	0.007
No	(65)	1			
Residency					
Urban	(43.7)	1.35 (1.27–1.81)	0.007	2.22 (1.27–3.41)	<0.001
Rural	(56.3)	1		1	

Table IV: Risk Factors Associated with COPD

Factors	(%)	Crude estimates	p-value	Adjusted estimates	p-value
		Odds Ratio (95% CI)		Odds Ratio (95% CI)	
Sex					
Female	(55)	1.17 (0.91–1.50)	0.227	1.25 (0.89–1.74)	0.195
Male	(45)	1		1	
Age					
>18	47.4	6.48 (4.76–8.82)	<0.001	2.41(1.66–3.50)	<0.001
<18	52.6	1		1	
History of /passive smoking					
Yes	(16.5)	2.80 (1.89–4.14)	<0.001	3.26 (1.96–5.41)	<0.001
No	(83.5)	1		1	
Family history of asthma					
Yes	(15.2)	3.57 (2.68–4.76)	<0.001	2.90 (1.98–4.22)	<0.001
No	(84.8)	1		1	
Exposure to biomass†				2.04(1.29-3.21)	0.002
Yes	(44)	1	0.001		
No	(56)	1			
Residency					
Rural	(27.7)	6.48 (4.76–8.82)	<0.001	2.41 (1.66–3.50)	<0.001
Urban	(72.3)	1		1	

to health systems on a global scale. Unfortunately, many developing countries lack standardized protocols for the assessment and management of chronic non-communicable respiratory conditions, such as Chronic Obstructive Pulmonary Disease (COPD) and Asthma. This lack of standardized protocols further exacerbates the burden of these diseases, particularly in regions with high levels of poverty and illiteracy, where access to healthcare services is severely limited or non-existent. Tragically, individuals in these vulnerable populations often succumb to these respiratory diseases before reaching the age of 40 years. The impact of chronic respiratory diseases is strikingly pronounced in different regions, with approximately 15% of the population affected in Latin America, 34% in the Arab world, and even higher rates of 45% in Sub-Saharan Africa and south-east Asia (15, 16).

Gender-based analysis revealed interesting patterns, with a higher proportion of male patients among asthma cases (53%) and a higher proportion of female patients among COPD cases (55%). These gender disparities might be attributed to variations in risk factors, environmental exposures, and genetic factors (17, 18).

Age emerged as a significant risk factor for both asthma and COPD. The study observed that the majority of asthma cases (72%) and COPD cases (53%) were in individuals above 18 years old. This finding aligns with the well-known fact that chronic respiratory diseases tend to manifest and worsen with age, reflecting the cumulative effects of exposures and lifestyle choices over time (19, 20).

Smoking, a well-established risk factor for both asthma and COPD, was evident in 21% of asthma cases and 17% of COPD cases. The majority of patients in both groups were smokers (79% for asthma and 83% for COPD). These findings underscore the substantial impact of smoking as a risk factor for chronic respiratory conditions in the studied population. Addressing tobacco use and implementing smoking cessation interventions are critical public health measures to mitigate the burden of asthma and COPD in this community. Additionally, anti-smoking campaigns, education on the risks of smoking, and accessible cessation support can be pivotal in reducing the prevalence of these chronic respiratory diseases and improving overall respiratory health in the population.

Smoking has been linked to a notable acceleration in the loss of lung function, with a potential decrease of up to 50 ml per year. This effect exhibits a clear dose-response relationship, implying that the more a person smokes,

the greater the decline in lung function. Moreover, individuals with asthma who smoke may experience an even more significant loss of lung function, potentially leading to the development of Chronic Obstructive Pulmonary Disease (COPD).

However, the good news is that quitting smoking can have a positive impact on lung health. Studies, such as the Lung Health Study, have demonstrated that individuals who quit smoking at the beginning of an 11-year study experienced a slower annual decline in Forced Expiratory Volume in one second (FEV1). For men, the annual decline was reduced to 30 ml/year, and for women, it was reduced to 22 ml/year. In contrast, those who continued to smoke throughout the study experienced a steeper decline in FEV1, with men losing 66 ml/year and women losing 52 ml/year.(21-23). These findings underscore the importance of smoking cessation for preserving lung function and overall respiratory health. Quitting smoking can significantly slow down the decline in lung function and potentially prevent the development of severe respiratory conditions such as COPD.

Family history was significantly associated with both asthma and COPD, with 56% of asthma cases and 15% of COPD cases having a family history of asthma. This highlights the genetic predisposition to respiratory diseases and emphasizes the importance of considering family history when assessing individual risk and implementing preventive measures.

Exposure to environmental factors, such as gases and dust, was reported by a substantial proportion of asthma (35%) and COPD (44%) cases. These findings underscore the impact of environmental pollution and occupational hazards on respiratory health in urban areas.

Numerous studies have indicated a potential link between pesticide exposure and the development of asthma, as well as a possible association with Chronic Obstructive Pulmonary Disease (COPD). In recent research conducted in the Netherlands(24), a longitudinal community-based study found evidence of an association between pesticide exposure and accelerated decline in lung function. Notably, this association was more pronounced among individuals who were smokers.

The findings from these studies raise concerns about the impact of pesticide exposure on respiratory health, particularly among individuals already at risk due to smoking. Further investigation is needed to better understand the mechanisms underlying this association and to develop effective strategies to mitigate the potential adverse effects of pesticide exposure on lung function and respiratory health. As pesticide usage is prevalent in various occupational and environmental settings, it is crucial to raise awareness and implement appropriate preventive measures to safeguard the respiratory well-being of individuals who may be at risk. Residency was found to be a significant risk factor, with a higher proportion of asthma (56%) and COPD (72%) cases in urban areas. Urban environments often have higher levels of air pollution, occupational exposures, and lifestyle factors that contribute to respiratory diseases. In contrast, rural areas showed a lower prevalence of both conditions, suggesting that the environment and lifestyle factors in rural settings may provide some protective effects.

The adjusted estimates for risk factors demonstrated that age above 18 years, history of/passive smoking, family history of asthma, exposure to gases and dust, and urban residency were consistently associated with an increased risk of both asthma and COPD. These findings highlight the importance of a comprehensive approach to respiratory disease prevention and management, encompassing targeted interventions for specific risk factors.

This study's results have significant implications for public health in the City of Mosul. The findings underscore the need for targeted interventions and preventive measures to address the identified risk factors. Strategies such as smoking cessation programs, environmental pollution control measures, and early screening based on family history could contribute to reducing the burden of asthma and COPD in the population. Moreover, public health campaigns and awareness programs aimed at promoting a healthy lifestyle and minimizing exposures to environmental hazards are crucial in mitigating the impact of chronic respiratory diseases.

Limitations of the study include the retrospective design, which might introduce recall bias, and the reliance on medical records for data collection, which could be subject to incomplete or inaccurate documentation. Additionally, the study's cross-sectional nature does not allow for establishing causal relationships between risk factors and respiratory diseases.

Recommendations for future studies in Mosul should prioritize the exploration of genetic factors influencing asthma and COPD susceptibility within the population. Investigating the specific genetic markers associated with these respiratory conditions can offer insights into individual predispositions, enabling the development of targeted prevention strategies. Additionally, there is a crucial need to assess the environmental impact on respiratory health, including comprehensive studies on air quality, pollution levels, and occupational exposures in Mosul. Identifying specific environmental triggers can facilitate the design of interventions aimed at reducing the prevalence of asthma and COPD. Furthermore, research should delve into lifestyle and behavioral factors, such as smoking, diet, physical activity, and socioeconomic status, to better understand their role in the occurrence

of these conditions. Tailoring interventions based on these factors can contribute to more effective preventive measures. Evaluating healthcare access and quality is essential to address potential barriers and enhance the overall management of asthma and COPD in the population. Additionally, exploring the potential of telemedicine and digital health solutions, especially in remote areas, can improve patient monitoring and care. Lastly, conducting health economics studies will provide valuable insights into the economic burden of asthma and COPD, guiding resource allocation and policy decisions for the benefit of individuals and the healthcare system in Mosul.

CONCLUSION

In conclusion, this study provides valuable insights into the prevalence and risk factors associated with asthma and COPD in the City of Mosul in 2021. The results emphasize the need for targeted public health interventions and preventive measures to address modifiable risk factors and reduce the burden of chronic respiratory diseases in the population.

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