

Chronic Obstructive Pulmonary Disease as a Cardiovascular Diseases Risk Factor in Erbil

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ABSTRACT

Background and objectives: Chronic obstructive pulmonary disease (COPD) has been reported as the most common cause of morbidity and mortality all over the world. The present study aimed to investigate a possible link between chronic obstructive pulmonary disease and increased risk of cardiovascular disease in Erbil, the Kurdistan Region of Iraq.

Methods: A quantitative, case-control study was conducted on 159 patients with COPD as the case group and 159 adult people without COPD as control group. Case groups were patients who have COPD and admitted to the medical ward at Hawler Teaching Hospital and Rzgary Teaching Hospital. Control groups were those without COPD and went to City Park and Mala-fandy Primary Health Center. Data was collected from January 2018 to August 2018 through direct interview and using a questionnaire. A spirometer machine was used to confirm the diagnosis of COPD. Data analysis was carried out through descriptive statistics (frequency and percentage), skewness-kurtosis test, t-test, Mann-Whitney U test, Pearson's Chi-squared test, and univariate logistic regression.

Results: Compared to the control group, patients with chronic obstructive pulmonary disease were found to be at a significantly higher risk of developing hypertension, diabetes, ischemic heart disease, dyslipidemia, and lung cancer. Moreover, there was an inverse correlation between increased severity of chronic obstructive pulmonary disease and increased hypertension and stroke. In addition, chronic obstructive pulmonary disease, hypertension, diabetes, and dyslipidemia were found to be significant risk factors for ischemic heart disease.

Conclusions: The risk of cardiovascular comorbidities was significantly higher in the patients with chronic obstructive pulmonary disease and there is a significant association between chronic obstructive pulmonary disease and cardiovascular comorbidities.

Keywords: Cardiovascular diseases, chronic obstructive pulmonary disease, Comorbidity

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD), which includes emphysema, asthma and chronic bronchitis, has been recognized as the most common cause of morbidity and mortality worldwide [1]. It is characterized by an obstruction of the lung airflow and not fully reversible due to

long-term inflammatory process throughout the airways, parenchyma, and pulmonary vasculature [2].

Approximately 20% of adult populations have reduced Forced Expiratory Volume in the first second (FEV1) values, which indicate impaired lung function [3]. Asthma, COPD, and fibrotic lung disease have been

recognized in adult individuals whose level of FEV1 is reduced [4]. Low-grade systemic inflammation has also been associated with atherosclerosis, stroke and ischemic heart disease. These conditions are important risk factors for cardiovascular morbidity and mortality among COPD patients [4]. Limited physical activity and cigarette smoke play a role in increased cardiovascular disease [5]. Studies have found that many patients diagnosed with COPD eventually die from cardiovascular disease; particularly ischemic heart disease [6,7]. Cigarette smoking could be an independent risk factor as it is one of the most common shared risk factors in both COPD and cardiovascular disease patients [8].

High prevalence of diabetes, dyslipidemia and hypertension was observed in COPD patients which was related with an increased risk of ischemic heart disease [9]. The aim of this study was to determine whether or not COPD is associated with increased risk of cardiovascular disease compared to the control group.

METHODS

A quantitative case – control study was carried out from January 2017 to May 2019 to determine whether or not obstructive lung disease patients present greater cardiovascular diseases and comorbidity than control subjects in the Erbil, Kurdistan region of Iraq.

This study was approved by the Scientific and Ethical Committee at Hawler Medical University/ College of Nursing. Prior to data collection, all study participants were informed about the aim and characteristics of the study. They gave their written consent for participation.

A questionnaire was constructed and Spirometer machine was used to collect the necessary data. Two experts in the field were present in order to approve and review the validity of the questionnaire. The

questionnaire consisted of two sections. The first section was socio-demographical characteristics of patients. The second section was composed of questions regarding presence of cardiovascular disease, comorbidities of obstructive lung disease, and severity of chronic obstructive pulmonary disease. A Spirometer is a tool used to confirm the diagnosis of COPD. Reduced Forced Expiratory Volume in the first second (FEV1), <80% of the predicted value in combination with an (Forced Expiratory Volume in the first second (FEV1) / Forced Vital Capacity (FVC) FEV1/FVC, <70% indicates the limitation of lung airflow that is not fully reversible [10,11]. Global Initiative on Obstructive Lung Disease criteria was used to categorize the severity of airflow limitation into stages: I: FEV1 \geq 80%, II: FEV1= 50–80, III: FEV1= 30–50, IV: FEV1<30 [1]. The matching criteria for the case group as well as for the control group were: age over 40 years old and cigarette smoking history. The inclusion criteria for case groups were patients who have COPD and admitted to the medical ward at Hawler Teaching Hospital and Rizgary Teaching Hospital. Control groups were those without COPD and went to City Park for recreation and Mala-fandy Primary Health Center. A total of 159 cases and 159 controls were selected purposively. During the time of data collection, only 159 patients were diagnosed with COPD. In order to have an equal number of cases and controls, 159 controls were selected to participate in the study.

All continuous variables were presented by mean and standard deviation. Frequency and percentage are used to express the result of the categorical variables. The skewness-kurtosis test was used to test the normality distribution of continuous variables. T-test was used to find the differences between groups in quantitative studies for those variables with normal

distribution and Mann–Whitney U test for non-normally distributed variables.

Pearson’s Chi-squared test was used to analyze the association between qualitative variables. In order to find the relationship between cardiovascular disease and chronic obstructive pulmonary disease patients, the Univariate logistic regression was used. Results with $P < 0.05$ were considered statistically significant.

RESULTS

The demographic and respiratory function characteristics of the participants are shown in Table 1.

Significant differences were found in the pulmonary function tests and there were no significant differences in terms of age. There were no differences between the groups in the distribution by sex, body mass index and cigarette smoking habits. Majority of patients were found to be in first and second stage of COPD.

Table 2 shows the prevalence of cardiovascular disease and comorbidities that were

found with case and control groups. With the exception of stroke (7.5% in case and 10.1% in control) and anemia (13.8% in case and 15.1% in control), the prevalence of all diseases was greater in COPD patients than in controls. Ischemic heart disease and hypertension were the greatest comorbidities in COPD group (82.4% and 71.7%) respectively.

When the case group was classified by COPD severity using the Global Initiative on Obstructive Lung Disease criteria, it was found that hypertension ($P = 0.111$) and stroke significantly decreased as the severity of the disease increased (and $P < 0.001$). There were no significant differences between the stages of COPD for diabetes and dyslipidemia. In stage IV of COPD, the prevalence of Ischemic heart disease was greater than in stage III ($P= 0.256$). However, there were no differences between the other stages. In addition, no significant differences were found between the stages for heart failure (Table 3).

Table 1: Demographical characteristics and respiratory function of the study participants

Characteristics	Case N(%) /M±SD	Control N(%) /M±SD	P value
Sex			
Males	104(65.4)	104(65.4)	> 0.999
Females	55(34.6)	55(34.6)	
Age (years)	62.05 ± 11.09	61.73 ± 11.47	0.800
BMI	26.23 ± 4.03	25.86 ± 3.17	0.354
Pack-years	1.086 ± 0.60	1.15 ± 0.67	0.398
FEV (%)	55.49 ± 18.06	80.01 ± 20.76	< 0.001
FVC (%)	47.70 ± 16.73	67.15 ± 16.89	< 0.001
FEV/FVC (%)	56.44 ± 10.37	74.86 ± 5.30	< 0.001
GOLD STAGES of COPD			
I	26(16.4)		
II	126(79.2)		
III	3(1.9)		
IIII	4(2.5)		

Table 2: Prevalence of cardiovascular disease and comorbidities among study sample

CVD and Co-morbidities	Case N (%)	Control N (%)	P -Value
Ischemic heart disease	131(82.4)	14 (8.8)	< 0.001
Heart failure	21 (13.2)	5 (3.1)	0.001
Hypertension	114 (71.7)	39 (24.5)	< 0.001
Dyslipidemia	124 (78)	34 (21.4)	< 0.001
Stroke	12 (7.5)	16 (10.1)	0.429
Diabetes	89 (56)	28 (17.6)	< 0.001
Anemia	22 (13.8)	24 (15.1)	0.750

Table 3: Prevalence of cardiovascular disease and comorbidities in patients with chronic obstructive pulmonary disease classified by degrees of severity.

Comorbidities	I: FEV1 ≥ 80%	II: FEV1= 50–80	III: FEV1= 30–50	IV: FEV1<30	P-Value
Hypertension	22 (19.3%)	85 (74.6%)	3 (2.6%)	4 (3.5%)	0.111
Stroke	2 (16.7%)	8 (66.7%)	2 (16.7%)	0 (0%)	0.001
IDH	24 (18.3%)	100 (76.3%)	3 (2.3%)	4 (3.1%)	0.256
Heart failure	2 (9.5%)	18 (85.7%)	0(0%)	1 (4.8%)	0.624
Dyslipidemia	23 (18.5%)	96 (77.5%)	2 (1.6%)	3 (2.4%)	0.543
Diabetes	13 (14.6%)	71 (79.8%)	3 (3.4%)	2 (2.2%)	0.423
Anemia	2 (9.1%)	18 (81.8%)	1 (4.5%)	1 (4.5%)	0.528

The prevalence of ischemic heart disease was greater in the presence of diabetes mellitus (P = 0.005), hypertension (P < 0.001), and dyslipidemia (P < 0.001) as well as cigarette smoking (P < 0.001). However, there were no significant differences between IHD and age group. Meanwhile, the prevalence of heart failure was also higher in the presence of dyslipidemia (P = 0.013). The Chi-squared analysis was used to find the association between cardiovascular and age groups. In this case, the Bonferroni

correction showed that there is no significant difference in age group (Table 4). Table 5 demonstrated that chronic obstructive pulmonary disease patients have greater risks for having hypertension (odds ratio [OR]: 7.77; 95% confidence interval [CI]: 4.71-12.82), diabetes mellitus (OR: 4.52; 95% CI: 2.77-7.37), and dyslipidemia (OR: 17.05; 95% CI: 9.72- 29.89). A univariate logistic regression analysis showed that COPD, hypertension, diabetes, and dyslipidemia were risk factors for ischemic heart disease.

Table 4: Prevalence of cardiovascular disease in patients with chronic obstructive pulmonary disease according to risk factors.

Risk factors	IHD N (%)	HF N (%)
Hypertension		
Yes	107 (81.7%)	17(81%)
No	24 (18.3%)	4(19%)
Diabetes		
Yes	80 (61.1%)	11(52.4%)
NO	51 (38.9%)	10(47.6%)
Dyslipidemia		
Yes	120 (91.6%)	12 (57.1%)
NO	11 (8.4%)	9(42.9%)
Anemia		
Yes	19 (14.5%)	5 (23.8%)
NO	112(85.5%)	16(76.2%)
Age group/year		
40-51	31 (23.7%)	0 (0%)
52-63	39 (29.8%)	5 (23.8%)
64-75	43 (32.8%)	11 (52.4%)
76-87	18 (13.7%)	5 (23.8%)
Cigarette/ day		
5-18	0 (0%)	0 (19%)
19-32	23(17.6%)	7 (33.3%)
33-46	47 (35.9%)	7 (33.3%)
47-60	61 (46.6%)	7 (33.3%)

Table 5: Risk factors for ischemic heart disease, results of the logistic univariate regression analysis.

Risk Factors	OR	95% CR	P- value
COPD	1.18	0.71-1.96	0.019
Gender	0.83	0.52 – 1.33	0.45
Age	1.14	0.90-1.44	0.19
Hypertension	7.77	4.71-12.82	0.001
Diabetes	4.52	2.77-7.37	0.001
Smoking	0.91	0.63 – 1.43	0.52
Dyslipidemia	17.05	9.72- 29.89	0.001

DISCUSSION

As revealed by the results of the present study, the mean age of case and control groups was similar. In a study conducted by de Lucas-Ramos et al. (2008), it was observed that patients in the COPD group were older than those in the control group [8]. The results also indicated that the two groups were not significantly different in terms of their sex. This finding is in agreement with other previously conducted studies [8, 1]. Moreover, no significant difference was observed between the two groups regarding their BMI. This finding is not similar to the study conducted by de Lucas-Ramos et al. (2012) who reported that the patients with COPD and controls had different BMI [1]. This difference might be related to the difference between the two studies in terms of their sample size. It was also seen that smoking among COPD patients was not a risk factor for cardiovascular diseases, because as seen in Table 1, there was no significant difference between the two groups in terms of their pack-years. This finding is not in agreement with those of the study carried out by de Lucas-Ramos et al. (2012) [1]. According to the results, FEV₁, FVC and FEV₁/FVC were significantly different in the two groups. Similar findings have been reported in previously conducted studies [12, 13].

The results of the present study also showed that there was a significant difference between the patients with COPD and the control group patients in terms of most of the comorbidities including hypertension, diabetes, ischemic heart disease, heart failure, dyslipidemia, and lung cancer. This finding is in agreement with those of the studies conducted by de Lucas-Ramos et al. (2012), López Varela et al. (2013), and Chatila et al. (2008) [1, 14, 15]. However, the two groups were not significantly different in terms of some

comorbidities such as stroke, anemia, and low dietary intake. This finding is not in agreement with the one reported by de Lucas-Ramos et al. (2012) who reported a significant difference between the COPD patients and the controls regarding anemia [1]. According to the results of data analysis, there was a significant inverse relationship between decreased hypertension and stroke and increased severity of COPD. This finding is in agreement with those of the studies carried out by Imaizumi et al. (2015) and Shujaat et al. (2007) who reported that as severity of COPD rises, the levels of stroke and hypertension drop. This could be due to small number of cases who were in stage III and IV [16, 17]. Other comorbidities; however, were not found to have a significant association with severity of COPD.

Moreover, the results revealed that there is a significant relationship between ischemic heart disease and diabetes mellitus, hypertension, dyslipidemia, and cigarette smoking. Therefore, these comorbidities can be regarded as risk factors for ischemic heart disease. This finding is similar to the results of previously conducted studies [18-20]. The results of data analysis in the present study also indicated that the risk of developing hypertension, diabetes mellitus, and dyslipidemia was significantly higher in patients with COPD compared to the control group. This finding is in agreement with the results of the previously conducted studies as well [1, 21, 22].

CONCLUSION

In conclusion, patients with COPD were confirmed to be at an increased risk of cardiovascular comorbidities, and there is a significant association between these two variables. However, the detailed mechanism of this relationship should be studied in the future studies.

CONFLICT OF INTEREST

The author report no conflict of interests

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