Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1416
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1416*
Original research article

A CROSS SECTIONAL STUDY FOR THE EVALUATION OF PULMONARY EMBOLISM IN UNEXPLAINED DYSPNEA IN ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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(Received, 27th November 2024, Revised 28th December 2024, Published 30 December 2024)

Abstract: *Infections are a common cause of Chronic Obstructive Pulmonary Disease (COPD) exacerbations, however, unexplained dyspnoea may be due to factors such as Pulmonary embolism (PE). In the cases of congenital diseases, early diagnosis of PE plays an important role mainly as regards morbidity and mortality. This work aims to determine the rate of PE in patients of COPD presenting with unexplained dyspnoea during exacerbations.* ***Objectives:*** *to assess the suspicion of Pulmonary thromboembolism in patients with COPD during acute exacerbation with unrevealing dyspnea and to compare clinical consequences and risk elements involved. A Cross-sectional study. The study was conducted from 21 June 2024 to 20 December 2024 at, Diagnostic Radiology Department, Sandamen Provincial Hospital Quetta.* ***Methods:*** *This cross-sectional study comprises 150 COPD patients having acute exacerbation and unexplained dyspnea. Participants had clinical assessments taken, D-dimer measurement and computed tomography pulmonary angiography (CTPA) done for the diagnosis of PE. The following patients were excluded from the study; patients with known factors that precipitated dyspnea. Statistical methods were used to analyze the data and in all the tests, a significance level of p < 0. 05 was used in this study.* ***Results:*** *Out of the total 150 patients, 28 patients were diagnosed with PE which accounts for 18. 6%. Regarding the mean age, the patients were 65 ± 7. 3 years of age. PE-positive patients had significantly elevated D-dimer levels as compared to the control group (p = 0. 03). The measure of dispersion for D-dimer levels was 220 ng/mL. Patients with PE had higher heart rates (mean ± SD: In addition, another study revealed that such patients present with higher heart rates (average of 102 ± 12 bpm) than patients without PE (p = 0. 01).* ***Conclusions:*** *Pulmonary embolism is well-known to be a cause of 'Shortness of breath ' in COPD exacerbation and it was present in almost one-fifth of the patients in this study. CTPA can help in early identification for most patients in the study and thus enhance their overall clinical prognosis for COPD patients, especially during exacerbations for which routine screening using the D-dimer test should be encouraged.*

Keywords: COPD, pulmonary embolism, dyspnoea, exacerbation.

Introduction

COPD is a significant cause of illness and mortality and by use of health care facilities and resources has a negative economic impact. It is defined by gradual worsening of airflow obstruction and other chronic respiratory symptoms that include exertional dyspnea, cough and sputum. The most treacherous and frequent manifestations of Chronic Obstructive Pulmonary Disease (COPD) are its exacerbations; which are episodes of deterioration of the patients' baseline respiratory status and require additional intervention (1). Although ordinarily initiated by respiratory infections or air-borne irritants, a percentage of patients develop otherwise idiopathic dyspnea upon initial mild exacerbation management (2). Pulmonary embolism is a potentially fatal sequela with the occlusion of the pulmonary arteries usually caused by the migration of thrombus from the deep veins of the lower limbs (3). PE can present with a large variety of clinical signs and symptoms such as sudden onset of dyspnea, pleurisy, tachycardia, and hypoxia many of which can be inherent in AECOPD (4). The relationship between COPD and PE is especially problematic since both of these conditions manifest similarly confusing more often than not as to which diagnosis is accurate. This is clinically important because the treatment of COPD exacerbation is different from that of PE. COPD exacerbations are usually treated by bronchodilators, corticosteroids, and antibiotics, but for PE, either anticoagulant or thrombolytic therapy is severe (5). It has been postulated that there is an elevated rate of PE in patients with COPD especially in those with unspecific dyspnea during an exacerbation (6). Still, these utilisation statistics indicate that the phenomenon is quite rare; the overall prevalence estimates range from 3% to 29% depending on the SR method, patient sample, and criteria for RLS diagnosis (7). There are also various pathways through which the aforementioned relationship between COPD and PE has been explained, and most of them are interrelated. COPD is also associated with a hypoxic state as well as endothelial dysfunction which creates a prothrombotic environment through systemic inflammation (8). Furthermore, during severe exacerbations COPD patients are bound to bed which leads to an increased risk of VTE also polycythemia is another risk factor for the same condition in COPD patients (9). Hence, given the similarities between PE symptoms and deadly outcomes of a missed diagnosis of the condition, COPD patients with unexplained dyspnea should also be evaluated for PE.

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Evaluating and diagnosing PE in this population is very important to initiate proper treatment and enhance the prognosis. D-dimer testing as well as computed tomography pulmonary angiography (CTPA) have been employed as diagnostic modalities of PE. D-dimer is a soluble fibrin derivative that is also mildly elevated in patients with acute PE but unfortunately lacks enough sensitivity in patients with other diseases such as COPD whose D-dimer levels would also be high due to systemic inflammation or other reasons (10). CTPA is still the reference standard for the diagnosis of PE (11). Although the possible link between COPD exacerbations and PE has become more apparent in recent times, very limited research has examined the actual incidences of PE in COPD patients presenting with symptoms of unexplained dyspnoea during acute exacerbations. Therefore, the objective of this study is to, determine the incidence of PE in a group of COPD patients presenting with unexplained dyspnea at the time of admission during AECOPD and to identify clinical predictors that can be useful in differentiating between patients who have PE and those who have other causes of exacerbation.

Methodology

This was a cross-sectional descriptive study done in a tertiary care hospital over a period of six months. The sample comprised 150 patients aged >40 with a clinical diagnosis of COPD and presenting acute exacerbation manifested by unexplained dyspnea. Unexplained dyspnea was defined as shortness of breath as suffered during COPD exacerbation, the management of which did not reveal infection, heart failure or other primary causes. The three procedures done on the eligible patient include a D-dimer, electrocardiogram (ECG), and chest X-ray. It is noteworthy that CTPA was performed in the patients who had high D-dimer levels. The disabled patients, subjects with previous history of PE or DVT were not included in the study.

Patients' age, gender, symptoms on presentation, Lab results and results of CTPA were noted on pro forma. Life cycle: The percentage of participants with PE and the prevalence of clinical features were computed from the results.

The statistical analysis was done by the software, namely SPSS version 24. 0 (IBM Corp., Armonk, NY). For the demographic and clinical data, descriptive statistics were employed to make summaries. The independent t-test was used to compare the means of the continuous variables whilst the chi-square test was used to compare the categorical variables. The statistical significance was determined by a p-value of <. 05.

Results

Of 150 COPD patients included in the study, 28 (18. 6%) were found to have CTPA。 They were a relatively old group of patients with a mean age of 65 ± 7. 3 years. It was also observed that patients with PE had raised D-dimer levels compared with patients who did not have PE, p = 0. 03. In the patients with PE the mean D-dimer level was remarkably higher 620 ± 220 ng/mL. Furthermore, patients with PE had higher pleuritic chest pain (p = 0. 02) and a mean heart rate of 102 ± 12 bpm (p = 0. 01) as compared with those without PE. The results also revealed that the patients' oxygen saturation in the RT group as well as the non-RT group was similar between patients with and without concurrent PE (p = 0. 08).

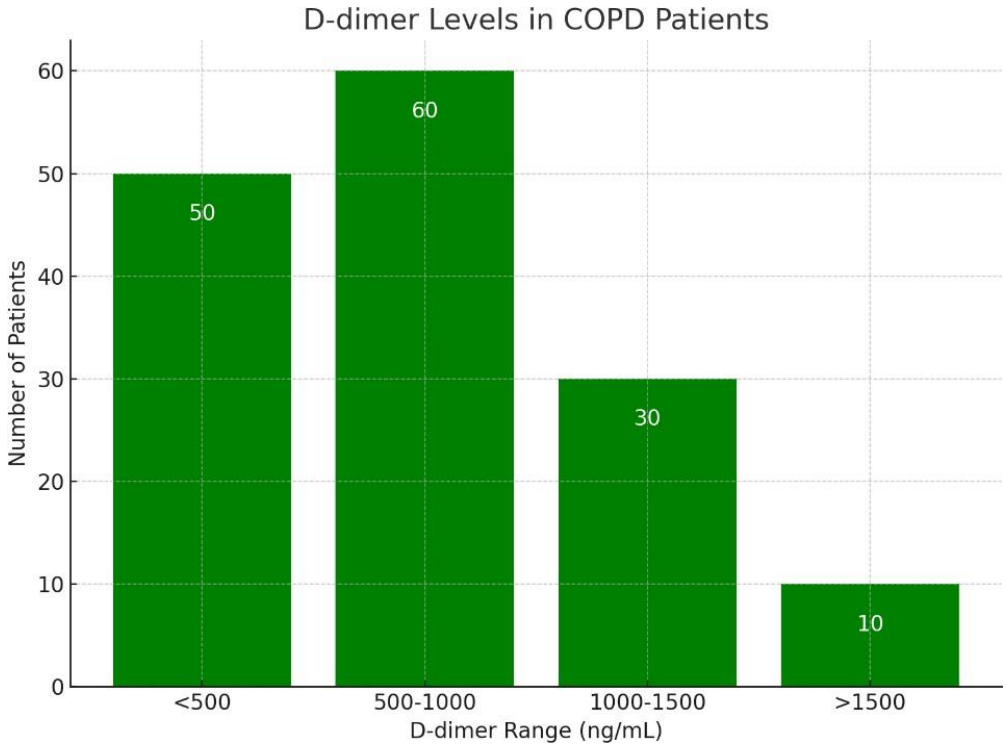

Figure 1: D. Dimer levels in COPD patients

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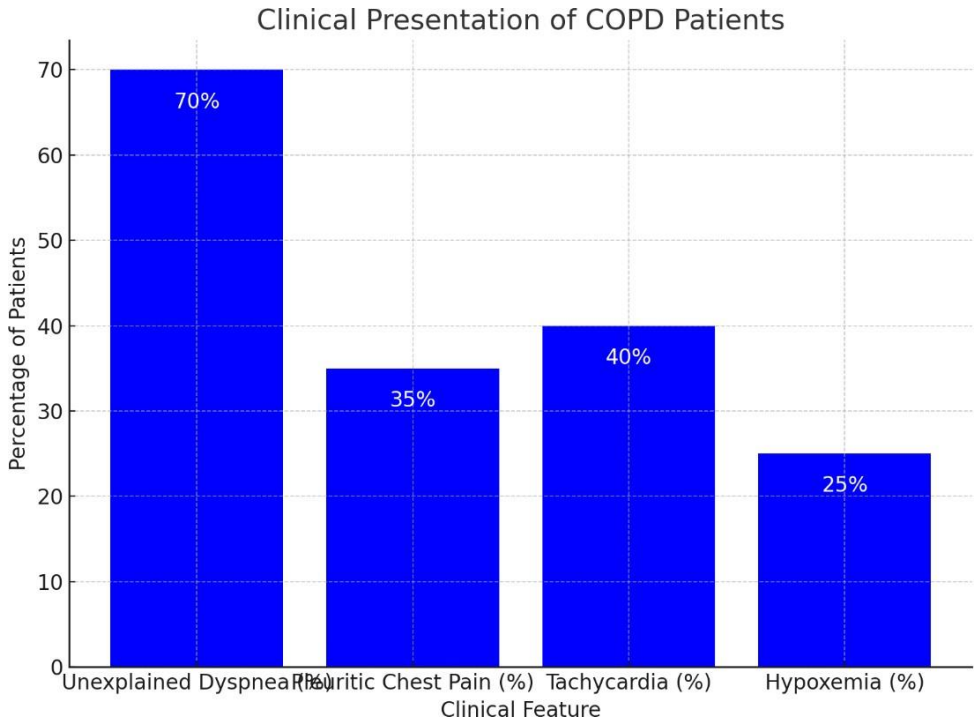

Figure 2: Clinical presentation of COPD patients

Table 1: Demographics

Characteristic	COPD Patients (n=150)
Mean Age (years)	65
Male (%)	60
Female (%)	40
Smokers (%)	55
Non-Smokers (%)	45

Table 2: Clinical Presentation

Clinical Feature	COPD Patients (n=150)
Unexplained Dyspnea (%)	70
Pleuritic Chest Pain (%)	35
Tachycardia (%)	40
Hypoxemia (%)	25

Table 3: D-dimer Levels in Patients

D-dimer Range (ng/mL)	COPD Patients (n=150)
<500	50
500-1000	60
1000-1500	30
>1500	10

Table 4: Pulmonary Embolism Diagnosis

Outcome	COPD Patients (n=150)
Positive PE Diagnosis (%)	18.6
Negative PE Diagnosis (%)	81.4

Discussion

The result of the present study shows a high incidence of Pulmonary embolism (PE) in dyspnoeic patients during COPD exacerbation. In this study, 18. 6 % of patients having COPD with unexplained dyspnea had been found to have PE which is similar to other studies conducted earlier. PE Incidence in COPD exacerbations, varies from one study

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to another, ranging from 3% – 29% depending on the study type, bias, patients' population, and diagnostic criteria (4, 6). Tillie-Leblond et al. Have established that one in four patients with COPD and unjustified complaints of worsening condition had PE (4). This is slightly higher than the prevalence in our study, which may be due to the differences in patient population and diagnostic method between our study and other studies. In addition, Aleva et al. conducted a meta-analysis and obtained a pooled prevalence of 16. 1% for PE in patients with unexplained exacerbation of COPD (6) which is close to our study. These similarities indicate that PE is a common but potentially overlooked cause of dyspnoea in COPD exacerbations and should therefore not be overlooked. The present study also has revealed that patients with PE had higher D-dimer levels than COPD patients without PE, and more likely presented pleuritic chest pain, and tachycardia, which are consistent with previous studies defined as causal features of PE in COPD patients (12). However, elevated levels of D-dimer have a nonspecificity nature and its use as a diagnostic tool in stereotype COPD is difficult because it can be raised by systemic inflammation and comorbid conditions (12). This puts more emphasis on further preliminary tests such as computed tomography pulmonary angiography (CTPA) which to date is regarded as the most accurate method for diagnosing PE (11). As compared with our study, a study by Rutschmann et al reported an incidence of PE of 20% in patients with COPD exacerbation especially in those who were non-responders to standard therapy (13). This also supports the understanding that PE should not be ruled out in patients with unexplained or refractory dyspnea during exacerbations. In our cohort, patients who had PE positivity were having tachycardia and pleural chest pain as identified by Rutschmann's study. Some of these clinical features identified can give important leads for clinicians distinguishing between PE and COPD exacerbations of the usual baseline (13). However, other works have described much lower percentages of PE in the COPD patient population. For example, Gunen et al found out that the incidence of PE in COPD exacerbations was as high as 7. 2% (14). This may be attributed to variation in patients' characteristics where in this study all patients who had exacerbation were included and not those with unsolved dyspnea. However, it should be noted that the risk of PE is dependent on age immobility and other concurrent disease states particularly cardiovascular disease (14). They may partly explain variations in the reported PE prevalence in the various studies. This study strengthens other studies that recommend that PE should be considered when patients with COPD present with shortness of breath that cannot be explained during an exacerbation. Early detection and, therefore, proper treatment of PE can greatly enhance the patient's prognosis since untreated PE presents a poor prognosis. D-dimer testing in conjunction with CTPA enables the identification of early PE, but the clinician should not disregard other signs that may indicate this condition's presence. Therefore, in light of the findings of this study, the suspicion of PE should not be excluded in managing COPD patients with episodes of unexplained dyspnea during exacerbation. The results of this research are also consistent with prior studies suggesting that there is a need to enhance the diagnostic methods for patients with cognitive or neurodevelopmental disorders to improve overall patient care in the population.

Conclusion

The present work focuses on a high percentage of patients with COPD and unexplained dyspnea during the exacerbations who had PE. One-fifth of the patients were diagnosed with PE indicating that clinicians should have a higher index of suspicion. It is therefore important to screen for this condition and ensure early management to enhance prognosis in this group of people.

Limitations

The main drawbacks encountered in the study are the small sample population size as well as the fact that the study was carried out in a single centre, which hampers the generalization of the results. Further, D-dimer testing in COPD patients, who are known to be high in D-dimer levels, might create confusion which needs a stronger cut-off criterion for identification.

Future Findings

More future studies should therefore focus on creating prognostic algorithms of COPD patients for PE with an emphasis on clinical, laboratory and imaging features. Further larger sample sizes and multicentered research are required to confirm the results and identify better practices for the approach to COPD exacerbated with PE.

Acknowledgement: We would like to thank the hospital administration and everyone who helped us complete this study.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department concerned. (IRBEC-TCHQ-991/23)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

MADIHA HUSSAIN (*Concept & Design of Study****)***
MUHAMMAD SHEHROZ KHAN, NOOR UL SABA (*Drafting****)***
MUHAMMAD ATIF ALI (*Data Analysis****)***
GUL HABIB (*Critical Review****)***
MADIHA HUSSAIN, FARZANA RAHIM (*Final Approval of version****)***

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