ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 14, Issue, 11, pp.4367-4371, November, 2023

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

FREQUENCY AND CLINICAL CHARACTERISTICS OF PULMONARY HYPERTENSION IN PATIENTS WITH BRONCHIECTASIS IN PORT SUDAN

[1]Dr. Murwan M.saeed [2]Dr. Osman Elshafee and [3]Dr. Mohammed QorashiAhmed

MD, Consultant Pulmonologist MD SMSBMD. MRCP, Fellowship of cardiology
Associate professor, Red Sea University Assistant professor Red Sea University

DOI: http://dx.doi.org/10.24327/ijrsr.20231411.0820

ARTICLE INFO

Article History:

Received 9th October, 2023
Received in revised form 25th October, 2023
Accepted 12th November, 2023
Published online 28th November, 2023

Keywords:

Frequency, Clinical, Characteristic, Pulmonary. Hypertension. Bronchiectasis

ABSTRACT

Background: Bronchiectasis is a chronic lung disease characterized by persistent and lifelong widening of the bronchial airways and weakening of the function mucociliary transport mechanism owing to repeated infection contributing to bacterial invasion and mucus pooling throughout the bronchial tree. Pulmonary hypertension, as a complication of bronchiectasis, is associated with increased morbidity and mortality. **Objectives:** to assess the frequency and clinical characteristic of pulmonary hypertension in patients with bronchiectasis. **Method:** A descriptive cross sectional hospital based study was conducted in Port Sudan teaching hospital, Red Sea state, Sudan from September 2021 to December 2021 and covered all patients diagnosed with bronchiectasis attended the chest clinic. Data entered, cleaned and analyzed using SPSS version 25.0. **Results:** This study covered 43 participants (patients diagnosed with bronchiectasis) with mean age of 49.7 ± 14.4 years and male: female ratio of almost 1:1. Clinically, the most common reported presentations were cough 42 (97.7%), finger clubbing 33 (76.7%), shortness of breath 323 (74.4%), and chest pain 29 (67.4%). The study showed that smokers were 10 (23.3%), HIV infection was 4 (9.3%), and 33 (76.7%) had positive history of pulmonary tuberculosis. The most common reported comorbidities were diabetes mellitus 5 (11.6%), hypertension 3 (7%), rheumatoid arthritis 2 (4.7%), Kyphoscoliosis 2 (4.7%), Cystic Fibrosis 2 (4.7%) and Aspergilloma 1 (2.3%). In regard to the ejection fraction, the study reported normal EF among 35 (81.4%), and severe among only 1 (2.3%). The frequency of pulmonary hypertension was 13 (30.2%). More than half of them were moderate 7 (53.8%), and severe 2 (15.4%). The study found that the occurrence of palpitation, syncope, lower limb edema, and (MRC) dyspnea scale were significantly increased with the occurrence of pulmonary hypertension (p values < 0.05 in all). **Conclusion:** Our study concluded that the frequency of pulmonary hypertension among patients with bronchiectasis was considerable significant and should not be ignored, as it exacerbates and worsening the symptoms. Therefore, care should be taken to close follow-up and early diagnosis V to reduce the occurrence of pulmonary hypertension among this group of patients and improve their outcome in Sudan.

INTRODUCTION

Bronchiectasis is dilatation of the bronchial walls resulting from chronic airway infection, which leads to structural lung tissue damage. It is manifested by repetitive productive cough and is occasionally associated with hemoptysis [1]. Bronchiectasis predominance is not clearly understood. Global statistics suggest that the incidence of bronchiectasis has risen over the past few years. Recent evidence shows that bronchiectasis disproportionately affects women and older individuals, and may be contributing to an increasing healthcare burden [2]. History of a long-standing cough with purulence is typical of bronchiectasis. Patients may report repetitive pulmonary infections that require antibiotics over several years. Patients can also present with progressive dyspnea, intermittent wheezing, hemoptysis, pleuritic chest pain, and associated fatigue and weight loss [3]. The hemoptysis is mild and manifested by blood flecks in the patient's usual purulent sputum, which is occasionally life-threatening. Often patients are diagnosed after many years of symptoms when a chronic cough or hemoptysis becomes debilitating [4]. Bronchiectasis is a progressive disorder with no cure. Hence, it is best managed by an inter professional team that includes the primary care physician, nurse practitioner,

Corresponding author:* **Dr. Murwan M.saeed
MD, Consultant Pulmonologist MD SMSBMD. MRCP, Fellowship of cardiology
Associate professor, Red Sea University Assistant Professor Red Sea university

pulmonologist, infectious disease expert, thoracic surgery, and an internist [5] Pulmonary arterial hypertension (PAH) is a chronic and progressive disease leading to right heart failure and ultimately death if untreated 3 definite diagnosis of Pulmonary hypertension is resting mean pulmonary artery pressure (m PAP) of ≥ 25 mmHg and a normal pulmonary capillary wedge pressure (PCWP) of ≤ 15 mmHg [6]. Pulmonary hypertension is a common complication of lung disease. In the most recent revised classification of pulmonary hypertension (PH), chronic lung diseases or conditions with alveolar hypoxia are included in WHO Group III of PH-related diseases [6]. The European Society of Cardiology and the European Respiratory Society (ESC-ERS) guidelines specify its role, essentially in the screening proposing criteria for estimating the presence of PH mainly based on tricuspid regurgitation peak velocity and systolic artery pressure (s PAP). [7] So, lastly, studies agreed that pulmonary hypertension (PH), as a complication of bronchiectasis, is associated with increased mortality. However, hemodynamic characteristics and the efficacy of pulmonary arterial hypertension (PAH) therapies in patients with bronchiectasis and PH remain unknown [8]. Pulmonary arterial hypertension (PAH) with severe hemodynamic impairment can occur in patients with bilateral bronchiectasis, and PAH therapy might improve hemodynamic in such patients [8]. Throughout this context, our study was an attempt to study the frequency and clinical characteristics of pulmonary hypertension in patients with bronchiectasis in chest clinic at Port Sudan teaching hospital - Red Sea State from

OBJECTIVES

General objective

This study conducted to assess the frequency and clinical characteristic of pulmonary hypertension in patients with bronchiectasis in Port Sudan- eastern Sudan.

Specific objectives

1. To compare the severity of symptoms in patients with pulmonary hypertension and those without
2. To assess the effect of pulmonary tuberculosis as a cause of bronchiectasis
3. To determine the effect of bronchiectasis with pulmonary hypertension on the left ventricular ejection fraction

MATERIALS AND METHODS

Study design

A descriptive cross sectional hospital based study

Study area

Port Sudan is a port city in eastern Sudan, and the capital of the state of Red Sea. As of 2007, it has 489,725 residents. Located on the Red Sea, it is Sudan's main seaport.

Study population

All patients diagnosed with bronchiectasis attending Port Sudan hospital chest clinic from September 2021 to December 2021.

Inclusion criteria

Adult patients who are diagnosed with bronchiectasis proven by highresolution CT scan of the chest.

Exclusion criteria

Patients who, had a history of valvular , or rheumatic heart disease, ischemic heart disease, or cardiomyopathy, congenital heart disease, previous resection lung surgery andpatients who known to have history of pulmonary embolism.

Sample size

All patients diagnosed with bronchiectasis attending port Sudan hospital chest clinic from September 2021 to December 2021. The total number of the participants covered in this study was 43 patients.

Data collection tools

Data collection was through the a structured questionnaire for patients who were diagnosed with Bronchiectasis on CT chest base by radiologist and chest physician. Patients were enquired about the respiratory symptoms they have. Transthoracic echocardiography was done by the cardiologist to assess Pulmonary Artery Pressure and Ejection fraction (EF). The questionnaire was tested (Pilot study) in a similar community (port Sudan chest clinics) by filling 10 questionnaires to estimate: the time needed to fill each questionnaire and whether the questions are clear or not and accordingly the final questionnaire was designed. Transthoracic echocardiography was done to assess Pulmonary Artery pressure and EF.

Data analysis methods:

The data was analyzed by statistical package for social sciences (SPSS).

RESULT

This study covered 43 patients diagnosed with bronchiectasis. More than half of them 22 (51.2%) were 40 - 60 years in age with mean age of 49.7 ± 14.4 years. The study showed similar gender distribution with male: female ratio of almost 1:1. Most of the participants were married 36 (83.7%), nearly half of them 19 (44.2%) were housewives. Clinically, the most common reported presentations were cough 42 (97.7%), finger clubbing 33 (76.7%), shortness of breath 32 (74.4%), chest pain 29 (67.4%), haemoptysis 26 (60.5%) ,lower limb edema 13 (30.2%) palpitation 6 (14%), syncpe 6 (14%) as detailed in Table (1).

Table 1 The distribution of the participants according to their clinical presentation (n = 43 patients diagnosed with bronchiectasis)

Presentation	Frequency	Percent (%)
Cough	42	97.7
Finger clubbing	33	76.7
Shortness of breath	32	74.4
Chest pain	29	67.4
Haemoptysis	26	60.5
Lower limb edema	13	30.2
Palpitation	6	14.0
Syncope	6	14.0

The study showed that smokers were 10 (23.3%), HIV infection was 4 (9.3%), and 33 (76.7%) had positive history of pulmonary tuberculosis. The most common reported co-morbidities were diabetes mellitus 5 (11.6%), hypertension 3 (7%), rheumatoid arthritis 2 (4.7%), Kyphoscoliosis 2(4.7%), Cystic Fibrosis 2 (4.7%) and Aspergilloma1 (2.3%) as shows in figure 1.

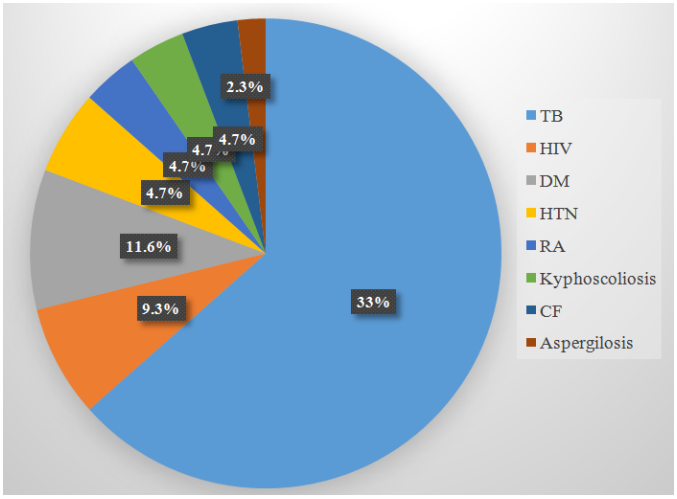

Figure 1 Distribution of the participants according to their comorbidities (n = 43 patients diagnosed with bronchiectasis)

In regards to the ejection fraction, the study reported normal EF among 35 (81.4%), mild dysfunction 4 (9.3%), moderate 2 (4.7%) and severe among only 1 (2.3%). The study found that the frequency of pulmonary hypertension (PASP >25 mmHg) was 13 (30.2%). More than half of them were moderate (PASP 41- 55 mmHg) in severity 7 (53.8%), severe (PASP > 55 mmHg) 4 (30.8%) and mild (PASP 25- 40 mmHg) 2 (15.4%) as shows in figure (2), cross tabulation was done to assess the possible association between the occurrences of pulmonary hypertension with the clinical presentation using chi square statistical test as detailed in table (2). The analysis found that the occurrence of palpitation, syncope, lower limb edema, and (MRC) dyspnea scale were significantly increased with the occurrence of pulmonary hypertension (p values < 0.05 in all).

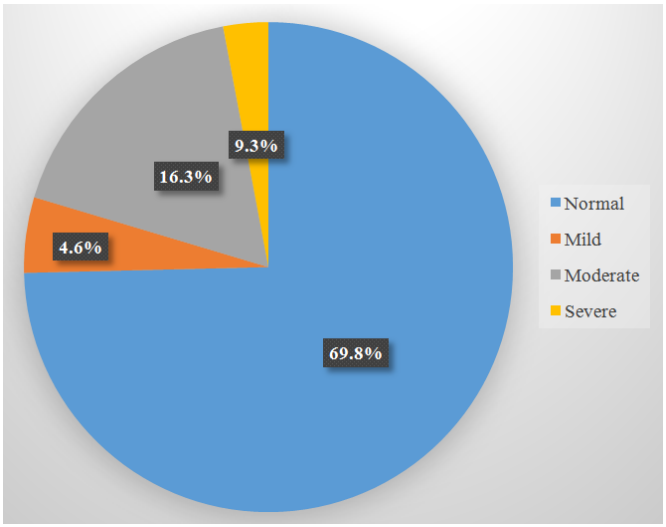

Figure 2 Distribution of the participants according to the occurrence of pulmonary hypertension (n = 43 patients diagnosed with bronchiectasis)

DISCUSSION

This study aimed to assess the frequency and clinical characteristic of pulmonary hypertension in patients with bronchiectasis and covered 43 participants (patients diagnosed with bronchiectasis). Our study reported that more than half of them 22 (51.2%) were 40 - 60 years in age with mean age of 49.7 ± 14.4 years with similar gender distribution. In similar context, Goeminne *et al* [9] reported that in general, bronchiectasis can exist in any age group. However, it generally occurred in childhood during the pre-antibiotic period .Bird K *et al* stated that bronchiectasis disproportionately affects women and older individuals, and may be contributing to an increasing healthcare burden [1].Nick JA *et al* stated that age is recognized as independent risk factors for respiratory diseases including bronchiectasis [10].

Table 2 Cross Tabulation Shows the Relation between Clinical Presentation and Severity of Pulmonary Hypertension among Participants (N = 43)

Presentation		Severity of pulmonary hypertension								P value
		Mild (n = 2)		Moderate (n = 7)		Severe (n = 4)		Total (n = 13)		
		Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Palpitation	Yes	1	50.0	1	14.3	2	50.0	4	30.8	0.1365
	No	1	50.0	6	85.7	2	50.0	9	69.2	
Syncope	Yes	1	50.0	2	28.6	1	25.0	4	30.8	0.808
	No	1	50.0	5	71.4	3	75.0	9	69.2	
Shortness of breath	Yes	2	100.0	7	100.0	4	100.0	13	100.0	-
	No	0	0.0	0	0.0	0	0.0	0	0.0	
Chough	Yes	2	100.0	7	100.0	4	100.0	13	100.0	-
	No	0	0.0	0	0.0	0	0.0	0	0.0	
Hemoptysis	Yes	0	0.0	4	57.1	2	50.0	6	46.2	0.788
	No	2	100.0	3	42.9	2	50.0	7	53.8	
Chest pain	Yes	1	50.0	4	57.1	3	75.0	8	61.5	0.664
	No	1	50.0	3	42.9	1	25.0	5	38.5	
Finger clubbing	Yes	2	100.0	6	85.7	3	75.0	11	84.6	0.749
	No	0	0.0	1	14.3	1	25.0	2	15.4	
Lower limb edema	Yes	1	50.0	4	57.1	4	100.0	9	69.2	0.323
	No	1	50.0	3	42.9	0	0.0	4	30.8	

Furthermore, Raghavan *et al* [11] reported that among patients of bronchiectasis, higher male prevalence is observed across age categories. In terms of disease severity, Morrissey *et al* [12] stated that females are reported to have more severe disease, poorer clinical outcomes, worse lung function and a survival disadvantage compared to males across all age groups in bronchiectasis. No study found to explain the role of gender in the occurrence of pulmonary hypertension among the bronchiectasis patients. This should better be an issue for further researches in future on this topic. Clinically, our study reported that the most common reported presentations were cough 42 (97.7%), finger clubbing 33 (76.7%), shortness of breath 32 (74.4%), and chest pain 29 (67.4%). Similar presentations were reported by bird *et al* [1] who reported the following symptoms among bronchiectasis patients; cough: 98%, sputum: 78% (sputum is typically mucoid and relatively odorless), dyspnea: 62%, 38 haemoptysis: 56% to 92%, and pleuritic chest pain: 20% (secondary to chronic coughing). Moreover, Smith *et al* [13] reported that the most common symptom that should prompt suspicion of a diagnosis of bronchiectasis is a persistent cough productive of mucopurulent or purulent sputum. Furthermore, Schoovaerts *et al* [3] agreed the core symptoms of bronchiectasis are cough and daily mucopurulent sputum production, often lasting months to years (classic), blood-streaked sputum or hemoptysis from airway damage associated with acute infection, dyspnea, pleuritic chest pain, wheezing, fever, weakness, fatigue, and weight loss and rarely, episodic hemoptysis with little to no sputum production

(ie, dry bronchiectasis) Our study showed that 33 (76.7%) history of pulmonary TB , smokers were 10 (23.3%), HIV 4 (9.3%), while the most common reported comorbidities were diabetes mellitus 5 (11.6%), and hypertension 3 (7%), and limited cases of rheumatoid arthritis, Kyphoscoliosis, Cystic Fibrosis and Aspergillosis. In similar issue, Smith MP *et al* [13] reported that risk factors for bronchiectasis are related mainly to cause of the disease, with prevalence higher in patients with autoimmune or connective tissue diseases. Others added chronic infections such as HIV [14] and chronic lung disease such as chronic obstructive pulmonary disease [15] and asthma [16]. Mandal *et al* [17] added that rhinosinusitis, cystic fibrosis and gastroesophageal reflux are also common among patients with bronchiectasis. Moreover, SALKIN *et al* [18] reported that bronchiectasis occurs frequently in association with pulmonary tuberculosis and is caused primarily by tuberculous bronchitis. Also, JONES *et al* [19] agreed that it is common in all types of tuberculosis, especially in the fibroid lesion stage and it may occur with active tuberculosis and become part of the tuberculous picture. Moreover, A H Holmes *et al* [20] stated that an increased frequency of bacterial 39 pneumonia occurs in HIV-infected individuals: however, the development of bronchiectasis is not well recognized. Lastly, Alyasin *et al* [21] found that Aspergillus sensitization (AS) and allergic bronchopulmonary aspergillosis (ABPA) can occur as a cause of permanent lung damage in patients with cystic fibrosis (CF) and non-CF bronchiectasis. In regards to the ejection fraction, the study reported normal EF among 35 (81.4%), mild dysfunction 4 (9.3%), moderate 2 (4.7%) and severe among only 1 (2.3%). In general, studies agreed that diffuse systemicpulmonary anastomoses and chronic hypoxemia may result in increase in ventricular work in bronchiectasis. Mehmet *et al* [22] stated that ventricular functions are impaired in bronchiectasis. They explained with the fact that the impairment of RV function is related to involved lung lobe number, arterial oxygen pressure, and acceleration time/ejection time of pulmonary flow. LV dysfunction was correlated only with RV function [22-23].Moreover, H Seibold *et al* [24] found that the left ventricular ejection fraction (LVEF) at rest was in the high normal range in all patients. It is recommend detailed assessment of cardiac function, particularly LV diastolic function, in patients with bronchiectasis. Our study found that the frequency of pulmonary hypertension was 13 (30.2%). More than half of them were moderate in severity 7 (53.8%), and severe 2 (15.4%). In similar context, Kessler *et al* [25] agreed that pulmonary hypertension in COPD is usually mild to moderate with preserved cardiac output, and evolves slowly alongside the progression of lung disease and hypoxaemia [25]. Moreover, in Saudi Arabia, Alzeer *et al* concluded that PH was more common in bronchiectatic patients [8]. Furthermore, Melanie *et al* reported that mild-to-moderate pulmonary 40 hypertension (PH) is a common complication of bronchiectasis [26]. Likewise, Naeije *et al* agreed that pulmonary hypertension is a common complication of chronic obstructive pulmonary disease (COPD) [27]. They added that the increase in pulmonary artery pressures is often mild to moderate, but some patients may suffer from severe pulmonary hypertension. Lastly, Opitz *et al* reported that the exact prevalence of pulmonary hypertension (PH) and corpulmonale (CP) in chronic obstructive pulmonary disease (COPD) is unknown, and varies considerably from 20-91% [28]. So, patients with severe PH with bronchiectasis should be referred to centers experienced in the management of PH and enrollment in clinical trials should be considered Our study found that the occurrence of palpitation, syncope, lower limb edema, and (MRC) dyspnea scale were significantly increased with the occurrence of pulmonary hypertension (p values < 0.05 in all).Weitzenblum E *et al* explained this association based of the fact that bronchiectasis subjects with PH were more hypoxemic and had a greater number of involved lobes than did the bronchiectasis subjects without PH ($P < 0.001$ and $P < 0.001$, respectively) which may explained the severity of symptoms and the survival rates differences on PH bronchiectasis patients [29]. They concluded that bronchiectasis subjects with PH have worse clinical patterns than do bronchiectasis subjects without PH and MRC dyspnea score is an independent predictor of longterm survival. Furthermore, In China, Lan Wang *et al* [30] conclude that PH with severe hemodynamic impairment can occur in patients with bilateral bronchiectasis and may cause deterioration in clinical status and overall prognosis. Also, Anand Devaraj *et al* reported that pulmonary artery diameter was the best predictor of mortality and was associated with symptoms and signs of bronchiectasis [31].Moreover, Melanie *et al* reported that the presence of PH is associated with poorer morbidities 41 and survival [26]. Moreover, Judith Hurdman *et al* [32] reported that PH severity of airflow obstruction, were independent predictors of morbidity and the overall management outcome in COPD patients including bronchiectasis. Accordingly, further studies may establish if PH severity has a clear role in the progression of the lung diseases such as bronchiectasis and improving survival Our study had some limitations. This study was conducted at one main teaching hospital, with limited sample size (only 47 patients and most of them from one state). So, future studies are recommended to cover larger number of patients to obtain more comprehensive information, especially in other areas in the states of Sudan.

CONCLUSION

42 This study covered 43 participants (patients diagnosed with bronchiectasis). The study found that the frequency of pulmonary hypertension was 13 (30.2%). Most of them were mild to moderate in severity. In this study, the analysis found that the occurrence of palpitation, syncope, lower limb edema, and (MRC) dyspnea scale were significantly increased with the occurrence of pulmonary hypertension.

Reference

1. Bird K, Memon J. Bronchiectasis. [Updated 2021 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430810/
2. Guan WJ, Han XR, de la Rosa-Carrillo D, Martinez-Garcia MA. The significant global economic burden of bronchiectasis: a pending matter. EurRespir J. 2019 Feb;53(2)
3. Schoovaerts K, Lorent N, Goeminne P, Aliberti S, Dupont L. National Survey on the Management of Adult Bronchiectasis in Belgium. COPD. 2019 Feb; 16(1):72-74.
4. O'Neill K, O'Donnell AE, Bradley JM. Airway clearance, mucoactive therapies and pulmonary rehabilitation in bronchiectasis. Respirology. 2019 Mar; 24(3):227-237. [PubMed].

5. Patel S, Cole AD, Nolan CM, Barker RE, Jones SE, Kon S, Cairn J, Loebinger M, Wilson R, Man WD. Pulmonary rehabilitation in bronchiectasis: a propensity-matched study. EurRespir J. 2019 Jan; 53(1).
6. Cottin V, Avot D, Lévy-Bachelot L, Baxter CA, Ramey DR, Catella L, Bénard S, Sitbon O, Teal S. Identifying chronic thromboembolic pulmonary hypertension through the French national hospital discharge database. PLoS One. 2019;14(4):e0214649.
7. Hoeper MM, Ghofrani HA, Grünig E, Klose H, Olschewski H, Rosenkranz S. Pulmonary Hypertension. DtschArztebl Int. 2017; 114(5):73-84.
8. Alzeer, Abdulaziz& Al-Mobeirek, Abdulellah& Al-Otair, Hadil & Elzamzamy, Usama & Joherjy, Ismail &Shaffi, Ahmed. (2008). Right and Left Ventricular Function and Pulmonary Artery Pressure in Patients with Bronchiectasis. Chest. 133. 468- 73. 10.1378/chest.07-1639.
9. Goeminne PC, Hernandez F, Diel R, Filonenko A, Hughes R, Juelich F, Solomon GM, Upton A, Wichmann K, Xu W, Chalmers JD. The economic burden of bronchiectasis - known and unknown: a systematic review. BMC Pulm Med. 2019 Feb 28; 19(1):54.
10. Nick JA, Chacon CS, Brayshaw SJ, *et al*. Effects of gender and age at diagnosis on disease progression in long-term survivors of cystic fibrosis. Am J RespirCrit Care Med 2010; 182: 614-626.
11. Raghavan D, Jain R. Increasing awareness of sex differences in airway diseases. Respirology 2016; 21: 449-459.
12. Morrissey BM, Harper RW. Bronchiectasis: sex and gender considerations. Clin Chest Med 2004; 25: 361-372.
13. Smith MP. Diagnosis and management of bronchiectasis. CMAJ. 2017; 189(24):E828-E835.
14. 12. King MA, Neal DE, St John R, *et al*. Bronchial dilatation in patients with HIV infection: CT assessment and correlation with pulmonary function tests and findings at bronchoalveolar lavage. AJR Am J Roentgenol; 168:1535-40.
15. Martínez-García MÁ, Soler-Cataluña JJ, DonatSanz Y, *et al*. Factors associated with bronchiectasis in patients with COPD. Chest 2011; 140:1130-7. 48
16. Gupta S, Siddiqui S, Haldar P, *et al*. Qualitative analysis of highresolution CT scans in severe asthma. Chest 2009;136:1521-8
17. Mandal P, Morice AH, Chalmers JD, *et al*. Symptoms of airway reflux predict exacerbations and quality of life in bronchiectasis. Respir Med 2013; 107:1008-13.
18. SALKIN D. Tuberculosis as a cause of upper lobe bronchiectasis. Calif Med.;73(6):577-580.
19. JONES EM, PECK WM, *et al*. Relationships between tuberculosis and bronchiectasis; a study of clinical and of postmortem material. Am Rev Tuberc. Mar; 61(3):387-398.
20. A H Holmes *et al*. Bronchiectasis in HIV disease. Q J Med. NovDec. 85(307-308):875-82.
21. Alyasin S, Moghtaderi M, Farjadian S, Babaei M, Teshnizi SH. Allergic bronchopulmonary aspergillosis in patients with cystic fibrosis and non-cystic fibrosis bronchiectasis. Electron Physician. 2018; 10(1):6273-6278.
22. Mehmet Gencer *et al*. Respir Med. 2006 Nov. Impact of bronchiectasis on right and left ventricular functions .Respir Med. 2006 Nov;100(11):1933-43.
23. RemziYilmaz *et al*. Impact of chronic obstructive pulmonary disease with pulmonary hypertension on both left ventricular systolic and diastolic performance. J Am SocEchocardiogr. 2005 Aug;18(8):873-81
24. H Seibold *et al*. Left heart function in chronic obstructive lung disease. Klin Wockenschr.
25. Kessler R, Faller M, Weitzenblum E, *et al*. "Natural history" of pulmonary hypertension in a series of 131 patients with chronic obstructive lung disease. Am J RespirCrit Care Med 2011; 164: 219-224.
26. Melanie J. Brewis, Alistair C. Church, Martin K. Johnson, Andrew J. Peacock. Severe pulmonary hypertension in lung disease: phenotypes and response to treatment. European Respiratory Journal 2015 46: 1378-1389
27. Naeije, R., Barberà, J.A. Pulmonary hypertension associated with COPD. Crit Care 5, 286 (2001). https://doi.org/10.1186/cc1049
28. Opitz I, Ulrich S. Pulmonary hypertension in chronic obstructive pulmonary disease patients. J Thorac Dis. 2018;10(Suppl 23):S2763-S2774.
29. 1Weitzenblum E, Hirth C, Ducolone A, *et al*. Prognostic value of pulmonary artery pressure in chronic obstructive pulmonary disease. Thorax; 36: 752-758.
30. 11Lan Wang *et al*. Clinical characteristics of pulmonary hypertension in bronchiectasis. Front Med. 2016 Sep. 10(3):336- 44.
31. AnandDevaraj *et al*. Pulmonary Hypertension in Patients with Bronchiectasis: Prognostic Significance of CT Signs. American Journal of Roentgenology. 2011; 196: 1300-1304.
32. Judith Hurdman *et al*. Pulmonary hypertension in COPD: results from the ASPIRE registry. European Respiratory Journal 2013 41: 1292-1301.

How to cite this article:

Murwan M.saeed Osman Elshafee and Mohammed QorashiAhmed, 2023. Frequency and Clinical Characteristics of Pulmonary Hypertension in Patients with Bronchiectasis in Port Sudan. *Int J Recent Sci Res.* 14(11), pp.4367-4371.

****