Section: Respiratory Medicine

Original Research Article

CLINICO RADIOLOGICAL AND PATHOLOGICAL PROFILE OF PATIENTS PRESENTING WITH HAEMOPTYSIS IN TERTIARY CARE HOSPITAL

V.Selvendran[1], Manikandan N[2], R.Manoj[3]

[1]Assistant Professor, Department of Respiratory Medicine, Annaii Medical College and Hospital, Chennai, Tamilnadu, India.
[2]Assistant Professor, Department of Respiratory Medicine, ACS Medical College and Hospital, Chennai, Tamilnadu, India.
[3]Assistant Professor, Department of Respiratory medicine, ACS Medical College and Hospital, Chennai, Tamilnadu, India.

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Corresponding Author:
Dr. R.Manoj,
Email: musichealsever@gmail.com

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Abstract

Background: Haemoptysis, the expectoration of blood from the lower respiratory tract, is a potentially life-threatening condition with diverse aetiologies. Its severity ranges from mild blood-tinged sputum to massive bleeding leading to asphyxiation or shock. Identifying the underlying cause through clinical, radiological, and bronchoscopy evaluation is crucial for effective diagnosis and management. This study aimed to determine the radiological and pathological profiles of patients with haemoptysis. **Materials and Methods:** This prospective study included 100 haemoptysis patients at Tirunelveli Medical College Hospital from June 2019 to June 2020. Patients presenting with haemoptysis to outpatient and inpatient departments were evaluated clinically and investigated with routine blood investigations, such as RBS, complete blood counts, renal and liver parameters, coagulation profile, sputum AFB, radiological tools, and bronchoscopy, if needed. A detailed history, comorbidities, and haemoptysis grading were assessed. **Results:** Males predominated, with 38% in the 50-65 age group. Haemoptysis was mostly mild (63%), moderate in 28%, and severe in 9%. Sputum production was the most common symptom (75%). Active PTB (39%) was the leading cause, followed by post-PT bronchiectasis (21%), and malignancy (18%). Chest radiography was normal in 36%, while chest CT showed ectatic changes (21%) and masses (18%). Severe haemoptysis was higher in smokers and PTB patients. Sputum AFB, CBNAAT, and imaging effectively diagnosed PTB, malignancy, and infections, with bronchoscopy improving the diagnostic yield. **Conclusion:** Our study concluded that both active tuberculosis and post-tuberculosis sequelae can result in haemoptysis of varying severity. Early and accurate diagnosis is crucial, with chest CT and bronchoscopy providing the highest diagnostic yield.

INTRODUCTION

Haemoptysis is defined as the expectoration of blood from the lower respiratory tract as a result of bronchial or pulmonary vascular haemorrhage.[1] It is a common and potentially life-threatening symptom with diverse aetiologies. The spectrum of haemoptysis varies widely, from blood-tinged sputum to coughing out large or massive amounts of blood. This remains a major problem for both patients and physicians. It is one of the most common manifestations of pulmonary and cardiovascular diseases.

The major issue in managing haemoptysis is the wider range of etiological factors that may result in haemoptysis of varying severity which may lead to asphyxiation and haemorrhagic shock. Appropriate and effective management of haemoptysis depends on identifying the aetiology and localisation of the site of bleeding.

The aetiology widely varies among multiple studies according to the publication time, the location of the study undertaken, and the diagnostic tests they performed.2 Recent studies indicate that pulmonary tuberculosis remains a leading cause, accounting for 60-68% of cases.[1,3] More recent literature has documented a change in this type of pattern with lung cancer and bronchiectasis as the commonest cause of haemoptysis in Western countries.[4] Diagnostic approaches typically involve a combination of clinical evaluation, radiological imaging, and bronchoscopy. CT chest and fibre optic bronchoscopy together provide the highest diagnostic yield, approaching 100%.[5,6] Microbiological

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analysis of sputum or bronchoscope samples can identify causative organisms, with Pseudomonas, Klebsiella, and E. coli being commonly isolated.[3] Radiological findings, particularly consolidation and cavitary lesions, often correlate significantly with the aetiology. The severity of haemoptysis varies, with some studies reporting a high prevalence of moderate to massive hemoptysis.[3] Given its potential severity and diverse aetiologies, haemoptysis requires thorough investigation for accurate diagnosis and effective management.

Aim

This study aimed to determine the radiological and pathological profiles of patients with haemoptysis.

MATERIALS AND METHODS

This prospective study included 100 patients in the Department of Respiratory Medicine, Tirunelveli Medical College Hospital, for one year from June 2019 to June 2020. Before the initiation of the study, the Institutional Ethics Committee approved the study (1381/TB/2018), and all patients provided informed consent.

Inclusion Criteria

The study included all patients aged > 18 years who presented with haemoptysis.

Exclusion Criteria

Patients on anticoagulant therapy, those with complaints of haemoptysis following an invasive procedure of the respiratory tract/lungs, pregnant women, and those who were unwilling to provide informed consent were excluded.

Methods

Patients presenting with haemoptysis to outpatient and inpatient departments were evaluated clinically and investigated with routine blood investigations, such as RBS, complete blood counts, renal and liver parameters, coagulation profile, sputum AFB, radiological tool (chest X-ray, HRCT/CECT-chest), and supplemented with bronchoscopy if needed to diagnose the cause of haemoptysis. Detailed case histories and thorough clinical examinations were performed.

A detailed history of the patient was obtained at the time of admission, including history of previous haemoptysis, PTB, any other lung disorders, bleeding disorder, use of anticoagulant medication for any clinical condition, presence of any other comorbid conditions, and smoking status of the patient. Special emphasis was placed on grading the quantity and frequency of haemoptysis. Initially, patients were investigated for more common causes, such as chronic bronchitis, pneumonia, and pulmonary tuberculosis, with blood counts, sputum analysis, and chest radiography. In selected cases, HRCT/CECT and bronchoscopy were performed to increase the diagnostic yield for haemoptysis. Data were presented as frequencies and percentages.

RESULTS

Males were predominant, with 38% in the 50-65 years age group, followed by 26% in the 36-49 age group. Females were distributed equally, with the highest percentage in the 50-65 and 66-79 range at 10% and 9%, respectively. Haemoptysis severity was predominantly mild in both genders, affecting 51% of males and 12% of females. Moderate haemoptysis was observed in 18% of males and 10% of females, while severe haemoptysis was less common in 6% of males and 3% of females. Regarding haemoglobin levels, males had a higher mean haemoglobin of 13.1 g/dl than females with 11.1 g/dl. [Table 1]

Table 1: Demographic and clinical characteristics

		Frequency (%)	
		Male	**Female**
Age in years	20-35	4 (4%)	4 (4%)
	36-49	26 (26%)	9 (9%)
	50-65	38 (38%)	10 (10%)
	66-79	7 (7%)	9 (9%)
Sex		75 (75%)	25 (25%)
Haemoptysis severity	Mild	51 (51%)	12 (12%)
	Moderate	18 (18%)	10 (10%)
	Severe	6 (6%)	3 (3%)
Mean haemoglobin (g/dl)		13.1	11.1

Among the associated symptoms, sputum production was the most frequently reported (75%), followed by breathlessness (56%), fever (42%), loss of appetite and weight (40%), and chest pain (12%). Regarding the severity of haemoptysis, most cases were mild (63%), 28% were moderate, and 9% were severe. The most common aetiology was active pulmonary tuberculosis (39%), followed by post-tuberculosis bronchiectasis (21%), lung malignancy (18%), post-PT aspergilloma (7%), post-PT fibro cavity (7%), bacterial pneumonia (3%), lung abscess (3%), and other miscellaneous causes (1%). [Table 2]

Table 2: Associated symptoms, severity, and causes of haemoptysis

		Frequency (%)
Associated symptoms	Sputum production	75 (75%)
	Dyspnoea	56 (56%)
	Fever	42 (42%)
	Loss of appetite and weight	40 (40%)

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	Chest pain	12 (12%)
Severity of haemoptysis	Mild	63 (63%)
	Moderate	28 (28%)
	Severe	9 (9%)
	Massive	0
Aetiology	Active pulmonary TB	39 (39%)
	Post-PT bronchiectasis	21 (21%)
	Lung malignancy	18 (18%)
	Post-PT Aspergilloma	7 (7%)
	Post-PT fibro-cavity	7 (7%)
	Bacterial pneumonia	3 (3%)
	Lung abscess	3 (3%)
	Miscellaneous	1 (1%)

On chest radiography, 36% of cases appeared normal; the most common abnormal findings were consolidation (29%), followed by nodules or masses (14%), ectatic changes (10%), cavitation (7%), and fibrosis (4%). On chest CT, ectatic changes were the most common (21%). Masses were identified in 18% of cases, consolidation in 13%, cavitation in 10%, fibrosis in 7%, and rare patterns such as the "tree-in-bud" appearance (2%) and miliary pattern (1%) and only 1% of CT scans appeared normal. [Table 3]

Table 3: Radiological findings

			Frequency (%)
Radiological findings	Chest x-ray	Normal	36 (36%)
		Consolidation	29 (29%)
		Nodules/Mass	14 (14%)
		Ectatic changes	10 (10%)
		Cavitation	7 (7%)
		Fibrosis	4 (4%)
	CT chest	Ectatic changes	21 (21%)
		Mass	18 (18%)
		Consolidation	13 (13%)
		Cavitation	10 (10%)
		Fibrosis	7 (7%)
		Tree in bus	2 (2%)
		Miliary pattern	1 (1%)
		Normal	1 (1%)

Most cases of haemoptysis were of mild severity, particularly when the symptoms were less than a week (55%), and only a small percentage of patients (8%) with a short symptom duration experienced severe haemoptysis. Regarding symptoms for a week or longer, 1% of the cases were severe, 8% were mild, and 2% were of moderate severity.

Regarding comorbid conditions, a history of pulmonary tuberculosis was associated with the highest proportion of severe cases (8%), followed by diabetes (4%). Chronic obstructive pulmonary disease or bronchial asthma, hypertension, and HIV infection were mostly mild cases, with no severe cases reported.

Regarding the smoking index, non-smokers predominantly had mild cases (28%), while heavy smokers showed a higher incidence of moderate (7%) and severe (4%) haemoptysis than light or moderate smokers. [Table 4].

Table 4: Comparison of symptoms duration, comorbid and smoking index across haemoptysis severity

		Haemoptysis severity (%)		
		Mild	**Moderate**	**Severe**
Duration of symptoms (week)	< 1	55 (55%)	16 (16%)	8 (8%)
	≥ 1	8 (8%)	2 (2%)	1 (1%)
Comorbid	Treated PTB	21 (21%)	13 (13%)	8 (8%)
	Diabetes	15 (15%)	11 (11%)	4 (4%)
	COPD/BA	3 (3%)	0	0
	Hypertension	1 (1%)	1 (1%)	0
	Both	1 (1%)	0	0
	HIV	1 (1%)	0	0
Smoking index	Non-smoker	28 (28%)	14 (14%)	3 (3%)
	Mild	4 (4%)	2 (2%)	1 (1%)
	Moderate	15 (15%)	5 (5%)	1 (1%)
	Heavy	16 (16%)	7 (7%)	4 (4%)

Sputum AFB, CBNAAT, and chest radiography were diagnosed in 26 (66.66%) of 39 active PTB cases, while the remaining 13 (33.33%) required chest CT and bronchoscopy, confirming PTB via bronchial wash CBNAAT (100%). Among the 21 post-PT bronchiectasis cases, chest X-rays were positive in 10 (47.61%), while 11 (52.83%) needed CT chest CT. Bronchoscopy, performed in all cases, identified

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Pseudomonas and Klebsiella oxytoca in two patients. In 18 malignancy cases, sputum cytology was negative, while chest X-rays identified masses in 14 cases (77.77%). Chest CT and bronchoscopy confirmed malignancy, with TBLB positive in 12 (66.66%) and CT-guided biopsy diagnosing the remaining six.

For the post-PT fibro-cavity (n=7), chest X-rays were positive in 6 (85.71%), while 1 (14.28%) required chest CT. Among post-PT aspergilloma cases (n=7), 3 (42.85%) showed an intracavitary mass on chest radiography, while 4 (57.14%) were diagnosed via chest CT. All three bacterial pneumonia cases had consolidation on chest radiography, with culture confirming Klebsiella pneumoniae in one case.

CT and FOB identified Klebsiella pneumoniae and Streptococcus pneumoniae in two cases. Lung abscess (n=3) presented with air-fluid levels on two chest X-rays, with culture confirming Klebsiella pneumoniae in one. CT and FOB confirmed Klebsiella pneumoniae and Streptococcus pneumoniae in two cases. One miscellaneous case (mucormycosis) had negative chest X-ray and CT findings, and bronchoscopy confirmed a fungal granuloma. [Table 5]

Table 5: Methodology of diagnosis

Causes	CHEST X-RAY & SPUTUM AFB/CBNAAT/C&S PERFORMED	SPUTUM AFB/CBNAAT POSITIVE/SPUTUM C&S POSITIVE	CHEST X-RAY POSITIVE	CT CHEST PERFORMED	FOB PERFORMED	FOB POSITIVE	CT-GUIDED BIOPSY PERFORMED	CT-GUIDED BIOPSY POSITIVE
Active PTB	39	26	26	13	13	13	0	0
Post PT-Bronchiectasis	21	0	10	21	17	2	0	0
Malignancy	18	0	14	18	18	12	6	6
Post PT-Aspergilloma	7	0	3	7	7	0	0	0
Post PT-FibroCavity	7	0	6	7	7	0	0	0
Bacterial pneumonia	3	1	3	3	3	2	0	0
Lung abscess	3	1	2	3	3	2	0	0
Miscellaneous	3	0	1	1	1	0	0	0

DISCUSSION

In our study, males were more susceptible to haemoptysis than females. A study by Haro et al. reported that haemoptysis was more common in male patients (77.4%), but the aetiology was sex-independent after accounting for the effect of tobacco.[7] The mean age of the patients was 51 years, with most patients between 50 and 65 years of age. A study by Fidan et al. reported that the mean age of the study population was 51, with most patients between 50-65 years old, and the leading causes of haemoptysis were lung cancer and bronchiectasis.[8]

In our study, regarding the etiological pattern of haemoptysis, 39% of patients with haemoptysis had pulmonary tuberculosis which was reported as the major cause, and the second most common cause was bronchiectasis in 21% of patients. This aligns with Kumar Gupta et al. who found that Pulmonary tuberculosis was the most common cause of haemoptysis, found in 39% of patients followed by bronchogenic carcinoma (14%) and bronchiectasis (13%).[9] A study by Prasad et al. found that Pulmonary tuberculosis was the leading cause of haemoptysis, accounting for 79.2% of cases.[10] Abal et al. also found bronchiectasis as the most common cause in 20% of patients.4 Hirschberg et al. found that bronchiectasis (20%), lung cancer (19%), bronchitis (18%), and pneumonia (16%) accounted for most causes of hemoptysis.2 MacGuinness et al. recorded haemoptysis in 25% of bronchiectasis and 16% of tuberculosis cases.[11]

Our study reported that 18% of patients had lung malignancy, which is the most common aetiology of pulmonary tuberculosis in developed countries. A study by Arooj et al. reported that the incidence of

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lung cancer in patients presenting with haemoptysis varies, with studies reporting rates of 16-18%.[12]

In our study, the severity varied significantly; most patients had mild or severe haemoptysis. A retrospective analysis by Fidan et al. reported that the severity of haemoptysis varied, with most patients having mild haemoptysis, and the leading causes were lung cancer and bronchiectasis.[8] A study by Shah et al. also reported that the severity of haemoptysis varied, with most patients having mild haemoptysis, and the most common causes were tuberculosis, malignancy, and bronchiectasis.[13]

In our study, the most common symptom associated with haemoptysis was productive cough, followed by dyspnoea, fever, weight loss, loss of appetite, and chest pain. A study by Hamilton et al. found that the most common symptoms associated with lung cancer with haemoptysis were dyspnoea, and abnormal spirometry with associated symptoms such as productive cough, fever, weight loss, loss of appetite, and chest pain.[14]

In our study, chest radiography, together with sputum AFB and CBNAAT, was able to diagnose 66.66% of patients with active PTB among 39 cases, and the remaining 33.33% were diagnosed with chest CT and bronchoscopy. A study by Chakraborti et al. found that direct sputum smear examination was positive in 56% of the patients. In comparison to MGIT, it had a sensitivity of 79% and a positive predictive value of 92% and has a high diagnostic yield in pulmonary tuberculosis suspects with hemoptysis.[15] A cross-sectional study by Bisht et al. concludes that CBNAAT is more effective than traditional methods for diagnosing pulmonary tuberculosis with 21.72% ZN stain positive, 33.46% being culture positive and 28.96% being CBNAAT positive.[16]

In our study, pulmonary lesions were the most common findings on chest CT (98.6%), followed by Lung parenchymal cavitary lesions (13.6%), and findings of bronchiectasis were noted in 28.76% of patients, Aspergilloma was seen in 9.58% of the patients and lung mass was seen in 24.65% of patients. A study by Greene et al. found that the most common feature is nodules, observed in 84-95% of cases and a halo sign, a nodule surrounded by ground-glass opacity, is an early indicator of invasive pulmonary aspergillosis, present in 61% of cases and associated with better treatment response and survival with other findings including consolidation, infarct-shaped nodules, and air-crescent signs.[17]

CONCLUSION

Our study concludes that both active tuberculosis and post-tuberculosis sequelae can result in haemoptysis of varying severity, and tuberculosis remains the most important and common cause of haemoptysis in India, which is evident from this study as well. This indicates the importance of eliminating tuberculosis. Haemoptysis is an acute emergency. Even a small streak of blood in sputum should not be ignored because of the fear of missing significant diseases, such as lung malignancy. Therefore, rapid and accurate etiological diagnosis must be performed as early as possible. The combined use of bronchoscopy and chest CT may provide the best diagnostic yield.

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