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Original Research Article

Clinical, radiological and microbiological profile of patients with bronchiectasis in a tertiary care center in South Kerala

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ABSTRACT

Background: Bronchiectasis is a common but neglected chronic lung disease. There is paucity of data from Southern India regarding the clinical, radiological and microbiological profile of patients with bronchiectasis.

Materials and Methods: To study the clinical profile, radiological pattern and microbiological flora in patients with bronchiectasis in a tertiary care center in South Kerala. A descriptive cross-sectional study done in 41 patients over 1 year.

Results: This study comprised 41 patients, of whom 18 were males (44%) and 23 were females (56.1 %), with a predominant population pertaining to 61-70 years (51.2%). Majority were non-smokers (65%, N=27). Most common cause was post-TB bronchiectasis (34%, N=14). Predominant symptoms were cough (73.2%, N=30) and sputum production (70.7%, N=29), predominant clinical sign was crepitation (73.1%, N=30). Majority had PFT showing obstruction (60.97%, N=25), among which 48% (N=12) had severe obstruction. Radiologically, most common CT pattern was cystic bronchiectasis (46.3%, N=19), predominantly located in lower lobes (63.4%, N=26) with bilateral involvement (65.9%, N=27). *Pseudomonas aeruginosa* was the most frequently isolated organism (43.9%, N=18) followed by *Klebsiella pneumoniae* (29.3, N=12).

Conclusion: Most of our patients were females and post TB bronchiectasis was the leading cause of bronchiectasis. Cough and sputum production were the most common symptoms. *Pseudomonas aeruginosa* was the commonest pathogen isolated from sputum samples. Spirometry showed obstructive pattern in majority of patients and cystic bronchiectasis being most common radiological pattern.

1. Introduction

Bronchiectasis is an irreversible and permanent dilatation of one or more medium sized bronchi associated with destruction of its walls and decreased mucociliary clearance which results in recurrent infections and reduction in expiratory airflow. Bronchiectasis may lead to recurrent respiratory tract infections sometimes with multidrug resistant organisms, impairment of lung functioning, hemoptysis and if not treated appropriately it may progress to respiratory failure, irreversible pulmonary hypertension, rarely life-threatening hemoptysis and sometimes amyloidosis. Bronchiectasis is associated with a poor quality of life and increased morbidity and mortality in the affected individuals. [1,2]

Earlier the diagnosis of bronchiectasis was cumbersome and needed an invasive radiological procedure with instillation of a radiopaque dye into the lung known as bronchography for the confirmation of its diagnosis but with the advent of advanced computerized tomography (CT) the gold standard for diagnosis is currently a non- invasive high-resolution CT (HRCT) of the lung and the availability of

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this non-invasive technique for confirmation has resulted in better detection of this disease.[3]

The etiology of bronchiectasis is due to recurrent lower respiratory tract infections which are not treated promptly with antibiotics hence the burden of the disease is more common in developing countries than in the developed ones. Also, the disease is more common in the lower socioeconomic strata due to poorer access to health care. As bronchiectasis is more common in the lower socioeconomic groups in developing countries, there is a relative paucity of research activity in the disease and it is sometimes referred as an "orphan disease". Sputum microscopy and culture is an easy, cost effective and non-invasive procedure which helps in identifying pathogens in patients with bronchiectasis.[4–8]

The objectives of this study were:-

1. To describe the clinical profile of patients with bronchiectasis in a tertiary care center in south Kerala.
2. To describe the radiological pattern in the study group.
3. To describe the microbiological profile in the study group.

1.1. Relevance of the study

Antibiotic resistance is a global problem, with huge impact on health care. It is perpetuated by irrational use of antibiotics. Bronchiectasis is characterized by frequent lower respiratory tract infections which requires antibiotic therapy. However, there is wide geographical variability of pathogenic bacteria in patients with bronchiectasis. Hence appropriate antibiotic can vary. Thus, it is important to generate local and regional data of pathogenic bacteria and antibiotic sensitivity. This will enable the clinicians to formulate and endorse a competent and rational antibiotic policy, which will help to curb the further worsening of the disease thus improving the quality of life for the patients with bronchiectasis.

2. Materials and Methods

2.1. Research questions

1. What is the common clinical profile among the bronchiectasis patients in a tertiary care center in south Kerala?
2. What is the common radiological pattern in the study group?
3. What are the common microbiological pathogens and antibiotic sensitivity in the study group?

2.1.1. Study design

Descriptive cross-sectional study

2.1.2. Place of study

Department of Respiratory Medicine, Pushpagiri Medical College, Thiruvalla.

2.1.3. Duration of study

1 year.

2.2. Study population

Patients with bronchiectasis of age >18 years of both gender who attended OPD and admitted under Respiratory Medicine Department of Pushpagiri Medical College, Thiruvalla, India were included in our study.

2.3. Sample size

Sample size was calculated using proportion of participants with cough (p) as symptom from previous study Nadia Sharif et al,[1] confidence level (1-α) as 95%, relative precision (d) as 5% of p.

The sample size obtained was 41 using the formula:

$n = (Z1- \alpha/2)\ 2\ p(1-p)\ /d2$

2.4. Inclusion criteria

Patients >18 years of age of both gender having bronchiectasis on HRCT of the chest who has given consent.

2.5. Exclusion criteria

1. Patients with history of interstitial lung diseases
2. Radiation therapy of chest
3. Cystic fibrosis of chest
4. Acquired immunodeficiency syndrome
5. Patients who were not willing to participate.

2.6. Sampling procedure

Patients who attended OPD and admitted under respiratory medicine with a diagnosis of bronchiectasis who satisfy the selection criteria were selected consecutively till sample size was achieved.

2.7. Study tools

Proforma with including clinical, radiological and microbiological profile.

2.8. Study procedure

Patients who attended the OPD and getting admitted in Respiratory Medicine Department after fulfilling the selection criteria and radiological features diagnostic of bronchiectasis or previously diagnosed cases of bronchiectasis were included in our study. After explaining the purpose of the study, consent was obtained from the participating subjects. A proforma was given to them and

information regarding the demographic data, childhood history, symptomatology and significant past and personal history were collected.

X-ray and HRCT chest was done to assess the radiological involvement. Sputum acid-fast bacilli (AFB) smear and culture, Cartridge based nucleic acid amplification test (CBNAAT), sputum culture and sensitivity and gram staining was done to assess the microbiological colonization. Spirometry was done for airway assessment.

2.9. Operational definitions

2.9.1. Clinical profile

Symptomology that is cough with or without expectoration, dyspnea (mMRC grading), hemoptysis, fever and clinical signs that is crepitation, clubbing, and rhonchi were assessed. Information regarding past and personal history were collected.

Pulmonary function assessment was done using spirometer. Patients with obstructive pattern is defined by FEV1/FVC ration <0.70 which was further graded into mild obstruction (FEV1 >80%), moderate obstruction (FEV1- 50 to 80%), severe obstruction (FEV1- 30% to 50%), very severe obstruction (FEV1 < 30%). Restrictive pattern is defined by FEV1/FVC >/=0.70 with FVC < 80%, normal pattern is defined by FEV1/FVC >/= 0.70, FVC > 80%, FEV1 > 80%.

2.9.2. Radiological pattern

Chest X-ray pattern of bronchiectasis: The chest radiograph would be abnormal in most patients with bronchiectasis. Suspicious, but non-diagnostic radiographic findings include linear atelectasis, dilated and thickened airways (i.e., tram or parallel lines, ring shadows on cross section) and irregular peripheral opacities that may represent mucopurulent plugs.

HRCT chest of bronchiectasis: Different patterns which are cylindrical, varicose, saccular and cystic bronchiectasis were analyzed in the study group. Lobe involvement which is either upper or middle or lower lobe and either unilateral or bilateral involvement in the study group were analyzed.

2.9.3. Microbiological profile

Early morning sputum sample was collected and send for AFB smear, CBNAAT and microscopy, *mycobacterium* and bacteriological culture.

2.10. Outcome measurement

HRCT was done to diagnose the patients with bronchiectasis. Clinical, radiological and microbiological profile was assessed as per proforma. The outcomes were presented as frequency and percentages.

2.11. Statistical analysis

The data was analyzed and presented as frequency and percentages for categorical data and descriptive statistics for continuous data. Frequency of symptoms, signs, radiological findings and microbiological findings were presented as percentage and 95% confidence interval.

3. Results

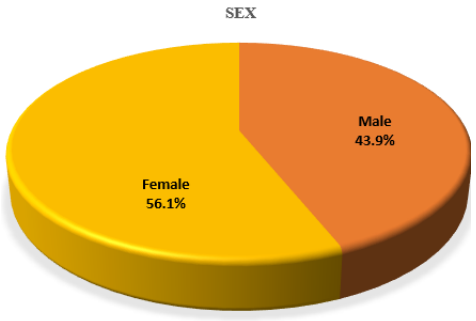

Fig. 1: Gender wise distribution of study subjects

Out of 41 patients, 18 (43.9%) were male, 23 (56.1%) were female.(Figure 1)

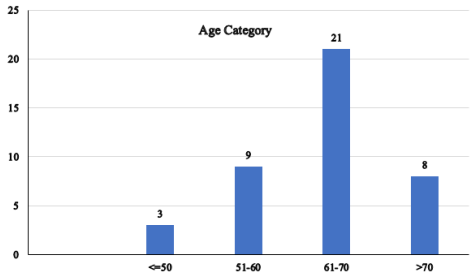

Fig. 2: Age wise distribution of the study subjects

The age of the patients was divided into four groups: <=50 years (7.3%, N=3), 51-60 years (22%, N=9), 61-70 years (51.2%, N=21) and >70 years (19.5%, N=8).(fig 2)

Out of 41 patients, 3 patients (7.3%) have history of allergy in the past, remaining 38 patients (92.7%) didn't have allergy history.(Figure 3)

Majority of patients were non-smokers (65.9%, N=27), 26.8%(N=11) were ex-smokers. 7.3% (N=3) were non-smokers. Mean pack years among patients with smoking history was 21.6 years.(Figure 4)

Out of 41 patients, 14 patients (34.1%) had past history of tuberculosis (TB). For 10 patients, no definite etiology could be identified. 9 patients (22%) had past history of COPD, 6 patients (14.6%) had pneumonia in past and 2 patients (4.9%) had past history of childhood fever.(Figure 5)

In our study population, 31.7% (N=13) had diabetes mellitus, 22% (N=9) had hypertension, 12.2% (N=5) had

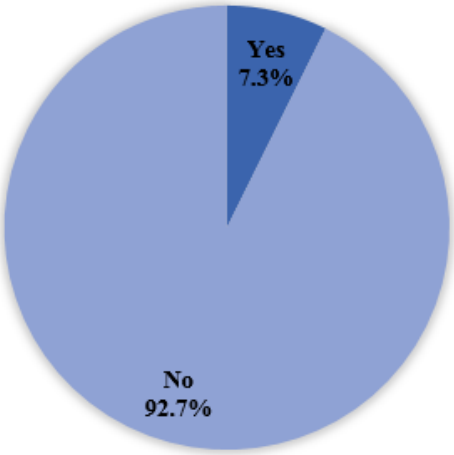

Fig. 3: Allergic history of study patients

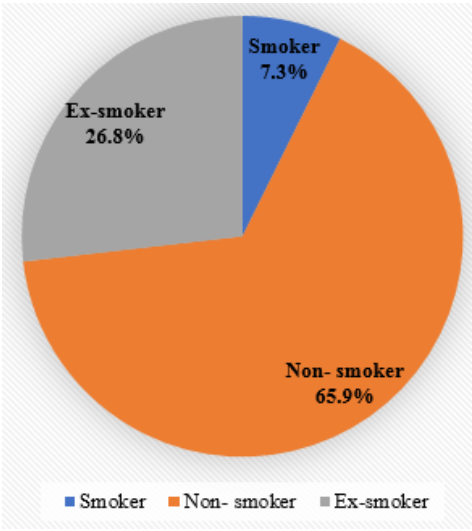

Fig. 4: Smoking prevalence in study patients

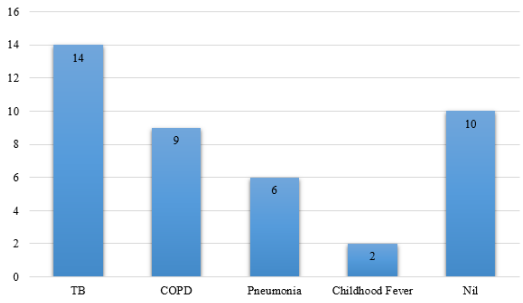

Fig. 5: Priordiagnosis of study patients

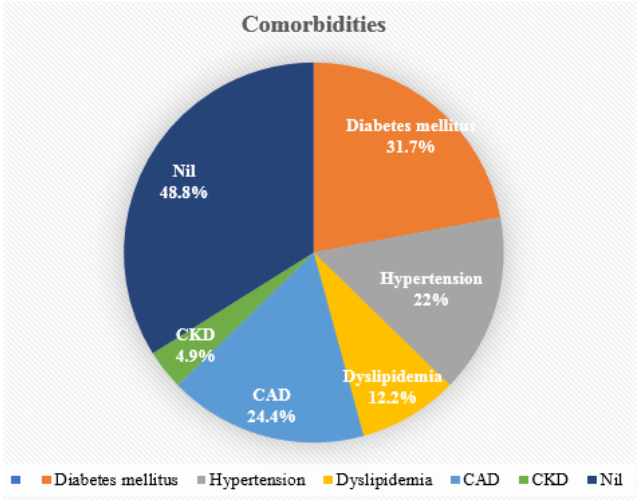

Fig. 6: Comorbidities of study patients

dyslipidemia, 24.4% (N=10) had coronary artery disease, 4.9% (N=2) had CKD, remaining 48.8% (N=20) didn't had any comorbidities.(Figure 6)

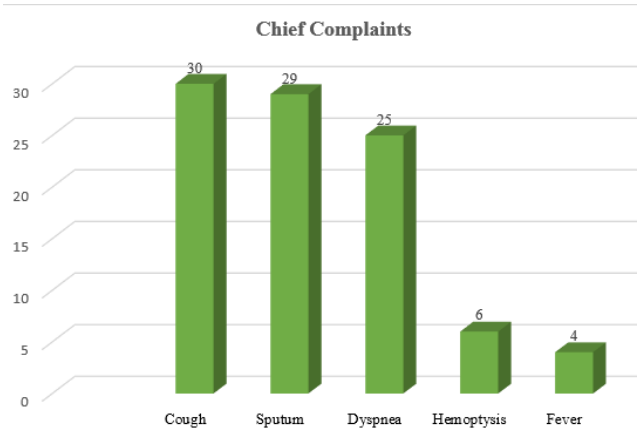

Fig. 7: Chief complaints of study patients

Most common symptom was cough (73.2%, N=30) followed by sputum (70.7%, N=29), dyspnea (60.9%, N=25), hemoptysis (15%, N=6) and fever (9.8%, N=4).(fig. 7)

In sputum characteristics, out of 29 patients 18 (62%) patients had mucopurulent sputum, 8 (27.5%) patients had mucoid expectoration and 3 (10%) patients had purulent expectoration.(Figure 8)

Among patients with dyspnea, 19 patients (76%) had grade 3 mMRC, 4 patients (16%) had grade 4 mMRC and 2 patients (8%) had grade 4 mMRC.(Figure 9)

On examination, 30 patients (73.1%) had crepitation's, 3 patients (7.3%) had rhonchi and 25 patients (61%) had clubbing.(Figure 10)

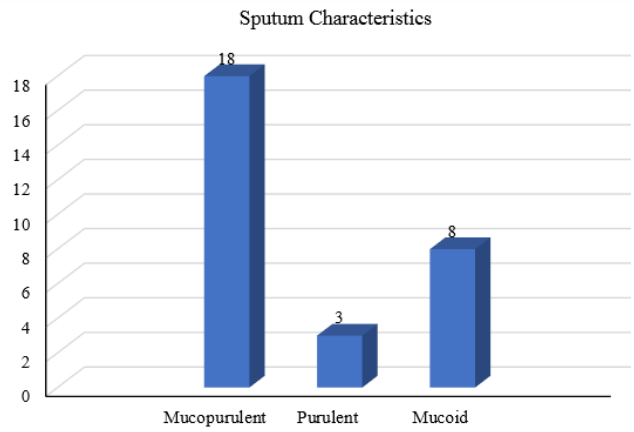

Fig. 8: Sputum characteristics of study patients

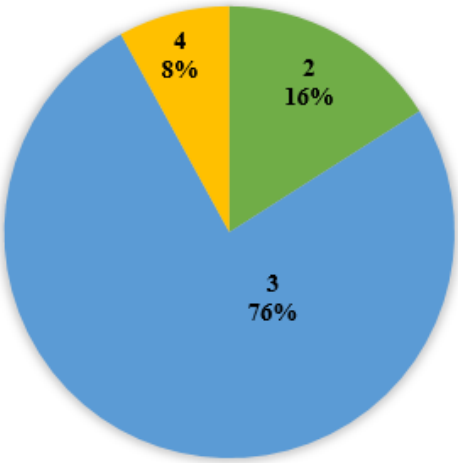

Fig. 9: mMRC grading of dyspnea in study patients

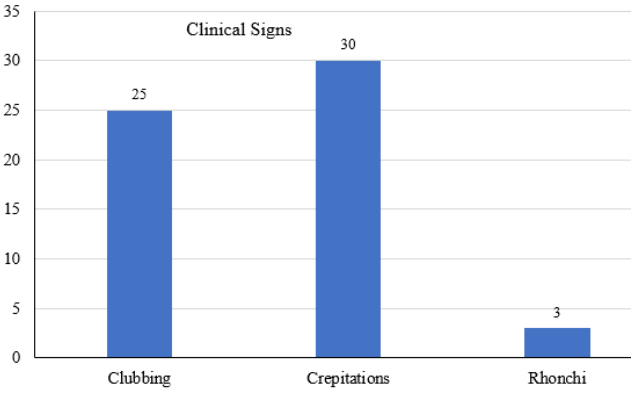

Fig. 10: Clinical signs of study patients

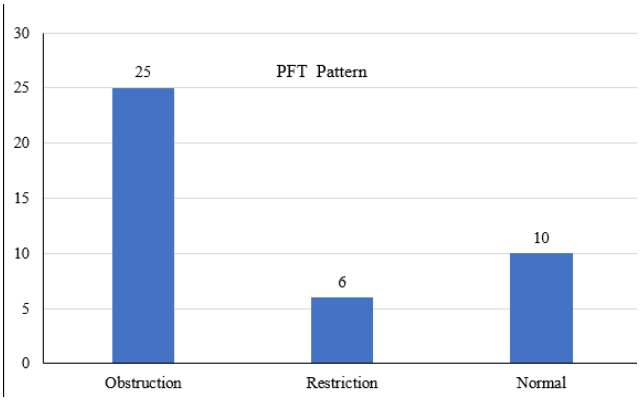

Fig. 11: Pulmonary function test (PFT) pattern of study patients

Out of 41 patients, 25 (60.97%) had PFT showing obstruction, 6 (14.6%) had restriction, 10 (24.4%) had normal PFT pattern. (Figure 11)

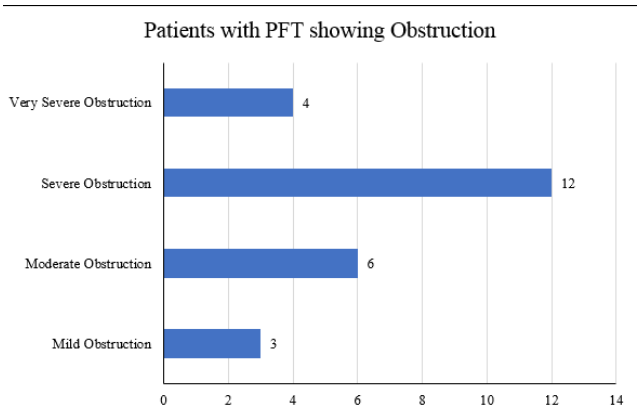

Fig. 12: Grading of obstructive pattern in study patients

Patients with PFT showing obstruction, 3 (12%) had mild obstruction, 6 (24%) had moderate obstruction, 12 (48%) had severe obstruction, 4 (16%) had very severe obstruction.(Figure 12)

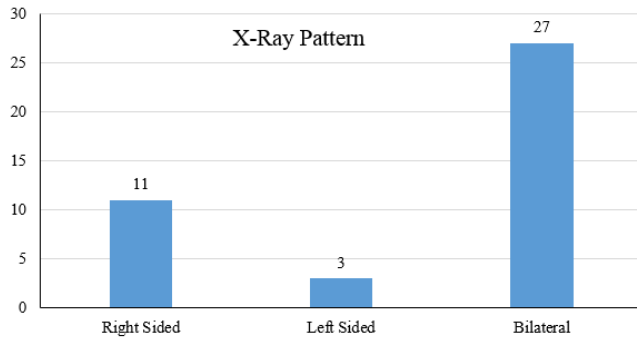

Fig. 13: X-ray pattern of study patients

65.9% (N=27) of patients had bilateral involvement, followed by right side involvement in 26.8% (N=11), left side involvement in left side 7.3% (N=3).(Figure 13)

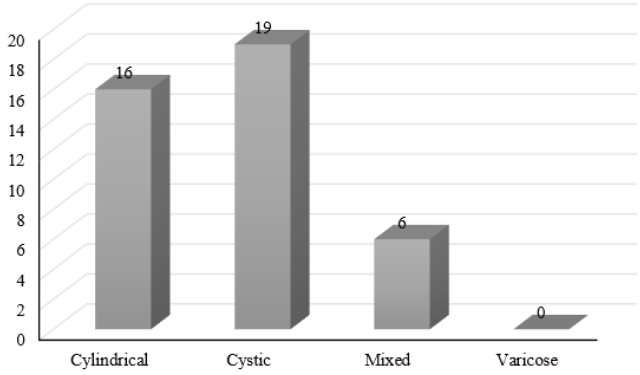

Fig. 14: CT pattern of study patients

Most common CT pattern was cystic pattern (46.3%, N=19), followed by cylindrical pattern (39%, N=16), remaining 14.6% (N=6) had mixed pattern of varicose and cystic.(Figure 14)

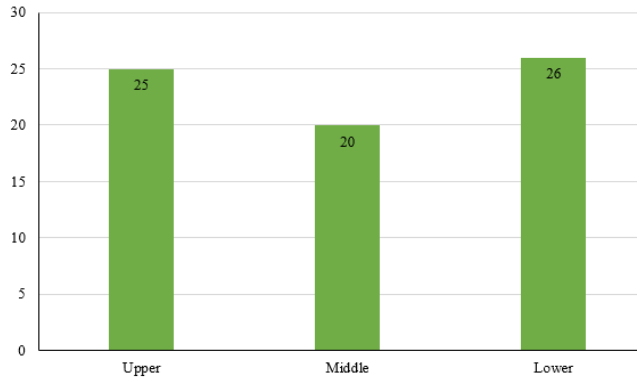

Fig. 15: Lobe involvement of study patients

63.4% of patients had lower lobe involvement (63.4%, N=26), upper lobe involvement in 61% (N=25) patients, middle lobe involvement in 48.8% (N=20) patients.(Figure 15)

8 patients (19.5%) had single lobe involvement, 16 patients (39%) had 2 lobes involved, 11 patients (26.8%) had 3 lobes involved, and 6 patients (14.6%) had 5 lobes involved.(Figure 16)

Out of 41 patients, Sputum culture report showed that 18 patients (43.9%) had *Pseudomonas aeruginosa* followed by 11 patients (26.8%) had *Klebsiella pneumoniae* and remaining 2 patients, one patient had *Acinetobacter baumannii* and the other patient had *E. coli*. For 10 patients' culture didn't show any growth.

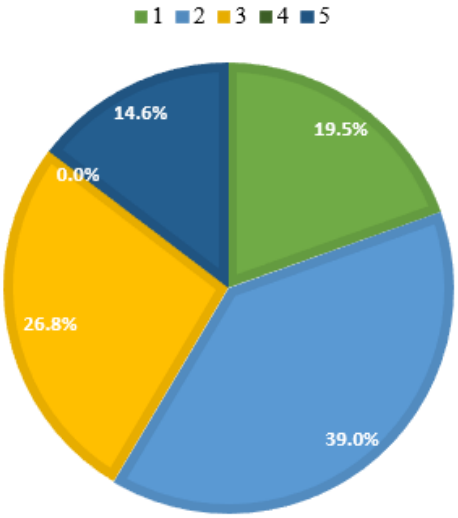

Fig. 16: Number of lobes involved in study patients

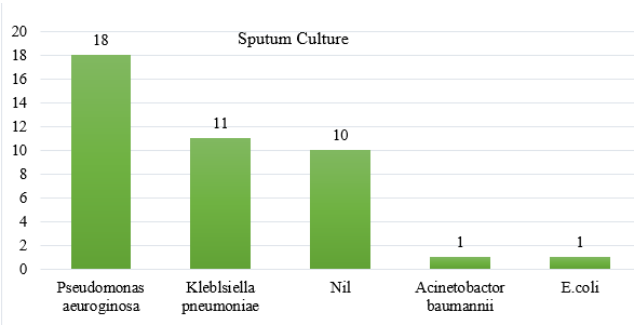

Fig. 17: Sputum culture of study patients

All 41 patients were sputum AFB smear and CBNAAT negative. *Mycobacterium* culture didn't show growth of tubercle bacilli.(Figure 17)

4. Discussion

4.1. Clinical picture

In this study, patients' age ranged from 28-77 years, with mean age of 63.17±10.28. Majority (51.2%) were in the age group of 61 to 70 years which was similar as compared to studies done in Dimakou et al.,[9] Weycker et al.,[10] and Lonni et al.[11]

A small female predominance (56.1%) was found among the 41 patients, reflecting the higher prevalence of bronchiectasis in women. Similar results were previously observed by Methe et al.,[2] Habesoglu et al.,[12] and Singh et al.[13] However, there was a male predominance, in study done by Sharif et al.[1]

The majority (65.9%) were nonsmokers, this may be due to the female predominance in this study, as seen in other studies such as Dimakou et al.,[9] Habesoglu et al.,[12] and

King et al.[14] Significant allergic history could not be elicited in most of the patients (92.7%) which has not been described in previous studies.[15–19]

Cough and sputum production were the most common symptoms, while crepitation was the most common clinical sign, according to Methe et al.,[2] Habesoglu et al.,[12] and King et al.[14] The most frequent symptoms in this study were cough (73.2%) and sputum production (70.7%) with sputum characteristics suggesting mucopurulent sputum (62%), followed by dyspnea, hemoptysis, and fever. On clinical examination, the majority had crepitation (73.1%), followed by clubbing and rhonchi. Most of the patients who reported dyspnea had grade 3 mMRC (76%).

According to Chalmers et al.,[20] chronic cardiac disease was most common comorbidity followed by diabetes mellitus and cerebrovascular disease. As per EMBARC study[21–26] ischemic heart disease was the most frequent comorbidity followed by GERD and diabetes mellitus. In this study, 20 patients (48.8%) had no comorbidities. Among patients with comorbidities, most common was diabetes mellitus seen in 13 patients (31.7%) followed by coronary artery disease (24.4%), hypertension (22%), dyslipidemia (12.2%) and CKD (4.9%).

The most common etiology of bronchiectasis in this study was post tuberculosis bronchiectasis (34.1%). Chandrasekaran et al.[27] conducted a pan-Indian study, as did the EMBARC study,[21] and found that tuberculosis was the most common underlying cause of bronchiectasis when combined with other severe infections, which is consistent with the high prevalence of tuberculosis in the Indian subcontinent.[28–31]

According to Singh et al.,[13] Habesoglu et al.,[12] Dimakou et al.,[9] Sharif et al.,[1] the most common PFT pattern was obstructive. In this study majority of patients had PFT showing obstruction (60.97%), among which severe obstruction was seen in 12 patients (48%), followed by normal PFT in 10 patients (24.4%) and restrictive in 6 patients (14.6%).

4.2. Radiological pattern

The most common X-ray findings in our study patients were dilated and thickened airways (i.e., tram or parallel lines) and cystic shadows. In this study majority had bilateral involvement (65.9%) which was also seen in similar studies Methe et al.,[2] Dimakou et al.,[9] Shoemark et al.[32]

Most common CT pattern was cystic bronchiectasis (46.3%) followed by cylindrical (39%) and mixed pattern (14.6%) in our study as seen in similar other studies by Methe et al.,[2] Lee et al.,[33] EMBARC study.[21] As the age progresses there was a positive correlation with CT pattern showing cystic bronchiectasis (p=0.029) which has not been described in previous studies.

8 patients (19.5%) had single lobe involvement, remaining 33 patients had multilobar involvement, predominantly located in the lower lobes (63.4%) which was seen in similar other studies Dimakou et al.,[9] Singh et al.,[13] and King et al.[14]

4.3. Microbiological study

According to Sharif et al.,[1] Methe et al.,[2] Dimakou et al.,[9] and Singh et al,[13] *Pseudomonas aeruginosa* was the most common organism isolated. In a multi-center study in India conducted by EMBARC.[21] *Pseudomonas aeruginosa* was the most common organism isolated and was associated with an increased risk of exacerbations, confirming airway infection as a key treatable trait in India as in Europe and the USA. In this study, *Pseudomonas aeruginosa* (43.9%) was the most common pathogenic microbial flora isolated followed by *Klebsiella pneumoniae*.[34–37]

5. Conclusion

1. Majority of our patients were females.
2. Post TB bronchiectasis was the leading cause of bronchiectasis.
3. Cough and sputum production were the most common symptoms.
4. Crepitation was the most common sign.
5. The majority of patients' spirometry results exhibited obstructive patterns.
6. Cystic bronchiectasis being most common radiological pattern.
7. *Pseudomonas aeruginosa* was the commonest pathogen isolated from sputum samples.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Acknowledgement

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