



ORIGINAL RESEARCH PAPER

Microbiology

SPIROMETRIC AND BACTERIOLOGICAL PROFILE IN POST TUBERCULAR BRONCHIECTASIS

KEY WORDS: Post Tubercular Bronchiectasis, Bacteriological Profile, Spirometric pattern

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ABSTRACT

Introduction: Tuberculosis is among the oldest diseases known to affect human beings. Pulmonary tuberculosis may result in pulmonary sequelae that are characterized by bronchial and parenchymal structural changes including bronchiectasis. Pulmonary function studies in these patients demonstrates variable patterns of impairments. Pseudomonas aeruginosa, Klebsiella pneumonia, Haemophilus influenzae, Streptococcus pneumoniae, Staphylococcus aureus are common pathogenic organisms in post-tuberculous bronchiectasis patients as suggested by previous studies. This study tries to find bacteriological and spirometry patterns in patients with post tubercular bronchiectasis.

Aim & Objectives: To study the common organisms found in post-tubercular bronchiectasis patients and to study the spirometric pattern of disease in them.

Material & Methods Patients between age 18 and 80 years who have completed anti-tubercular therapy in the past, confirmed as a case of post-tubercular bronchiectasis by clinical and radiological method (H.R.C.T) were included in the study. Spirometry and sputum bacteriological profile including gram staining and aerobic culture was done. Data was collected and statistical analysis was carried out.

Results: In our study post-tubercular bronchiectasis patient's spirometry showed all the three patterns of disease i.e. obstructive, restrictive, and mixed patterns. There was a predominance of mixed disease and the pattern of disease, closely followed by obstructive pattern and few patients showed restrictive disease. The pattern of lung disease (obstructive, restrictive, mixed) was related to age of the patient with majority of patients in younger age showing obstructive lesions. As the age advanced the prevalence of mixed pattern increased and restrictive pattern was more prevalent in older age individuals. Pseudomonas was the most common organism isolated from the sputum gram staining and culture. It was closely followed by other gram negative bacilli i.e. Klebsiella and Escherichia coli.

INTRODUCTION

Tuberculosis is caused by Mycobacterium tuberculosis. It is among the oldest diseases known to affect human beings. As per estimations every year 3.22 lakh Indians die due to TB and every 2 out of 5 Indians are infected with tuberculosis^{1,2}

Tuberculosis results in pulmonary sequelae that are characterized by bronchial and parenchymal structural changes, including bronchovascular distortion, bronchiectasis, emphysematous changes, and fibrotic bands. These changes are more or less permanent in the lungs and persist even after radical cure with anti-tubercular treatment³.

Pulmonary function studies in individuals with past history of pulmonary tuberculosis demonstrated variable patterns of impairment and with mild to severe forms of disease sequelae^{4,5,6}. Studies suggest the incidence of post-tubercular bronchiectasis to be ranging between 19% and 65%.⁷

Pseudomonas aeruginosa, Klebsiella pneumonia, Haemophilus influenzae, Streptococcus pneumoniae, Staphylococcus aureus are common pathogenic organisms in post-tuberculous bronchiectasis patients as suggested by previous studies. Aspergillus fumigatus and Candida are common fungal growth in sputum of these patients.⁸

A prevalence of all three types of patterns i.e. obstructive pattern, restrictive and mixed pattern was seen in spirometric evaluation of these patients⁹.

This study tries to find bacteriological and spirometry patterns in patients with post tubercular bronchiectasis and relation between

severity of disease (determined by FEV1, FVC and their ratio) and bacteriological pattern.

AIMS AND OBJECTIVES

- 1 To study the common organisms in post-tubercular bronchiectasis patients.
- 1- To study the spirometric pattern of disease in post-tubercular bronchiectasis patients.

MATERIAL AND METHODS

This is observational study and participants for the study were the outdoor patients and indoor patients of the department of Medicine and TB. & Chest, Hamidia hospital, Bhopal. This study was carried out on 100 patients of post-tubercular bronchiectasis over a period of two years starting from July 2015 to June 2017.

Methodology : Patients between age 18 and 80 years who have completed anti-tubercular therapy in the past, and who presented to OPDs and IPDs were evaluated for post-tubercular bronchiectasis. Sputum smear negative patients, confirmed as a case of post-tubercular bronchiectasis by clinical and radiological method (confirmed upon H.R.C.T) were included in the study. Spirometry and sputum bacteriological profile including gram staining and aerobic culture was done for these patients. Smokers were excluded from the study. FEV1 and FVC were compared with predicted values which was with respect to age, height, weight and sex of the patient. Bacteriological profile was based on gram staining and culture of the sputum samples.

Data was collected, then descriptive and observational statistical analysis was carried out in this study.

RESULTS

The following observations were made in our study:
Spirometric pattern of disease:

Among 100 cases it was found that most common pattern of involvement on spirometry was mixed (41 %) followed by obstructive (38%) while restrictive pattern and normal spirometric profile was seen in remaining cases(10% and 11% respectively).

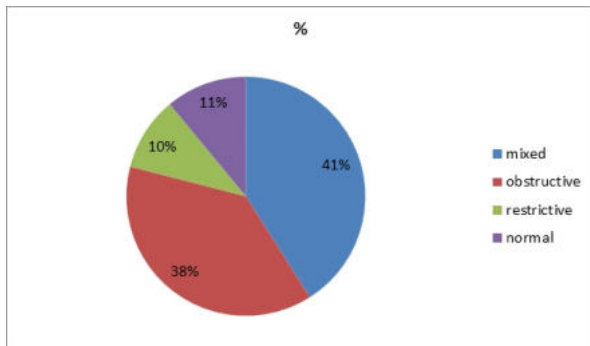


Diagram 1 : Above pie diagram shows percentage distribution of patients as per various spirometric pattern.

Correlation of disease spirometric pattern with age:

It was found that the pattern of disease varied with age of individuals, with normal pattern observed commonly in younger age group (mean age being 29.3 years male and 28.38 years female). Obstructive pattern was seen commonly in younger age groups (with mean age of presenting being 48.53 in males and 44.46 in females). As age advances prevalence of mixed pattern (mean age being 49.52 year male and 45.58 year female) was increased and restrictive pattern was evident in aged population(mean being 74 year for male and 53.25 years for female).

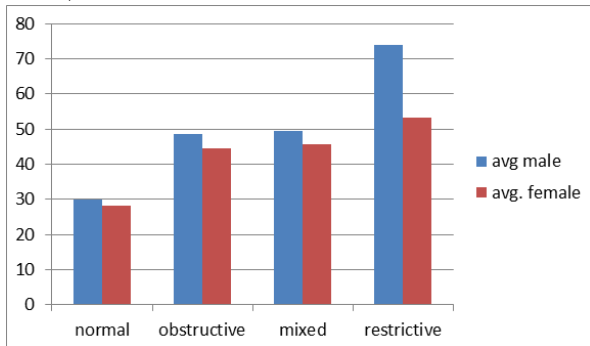


Diagram 2: The above diagram shows the mean age in various spirometric patterns.

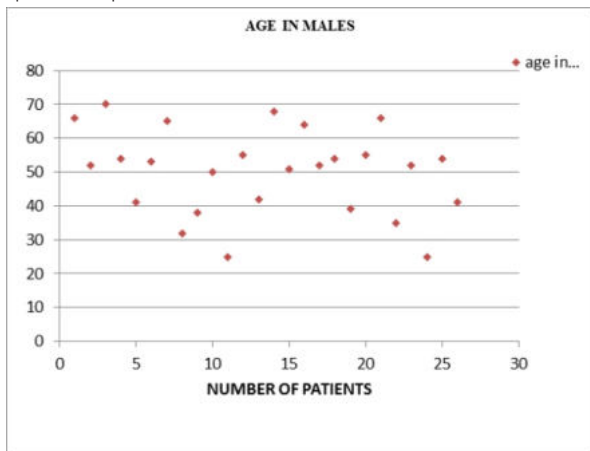


Diagram 3: The above diagram shows distribution of age in males

of cases with obstructive disease.

The age of cases with obstructive disease ranged from 25-70 years. Mean age of presentation with obstructive pattern in males was 48.53 years.

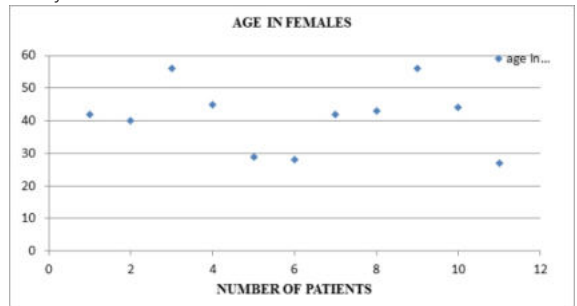


Diagram 4: This diagram shows the distribution of age in female cases with obstructive lung disease.

The range of age for females with obstructive disease was 27 years to 56 years. The mean age of presentation in females with obstructive lung disease in post-tubercular bronchiectasis was 44.46 years.

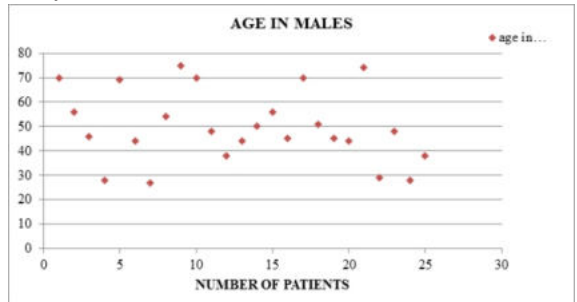


Diagram 5: The above diagram shows distribution of age in male patients with mixed pattern of disease.

The range of age in these patients was 27 years to 74 years. Mean age of presentation in males with mixed pattern of illness was 49.52 years.

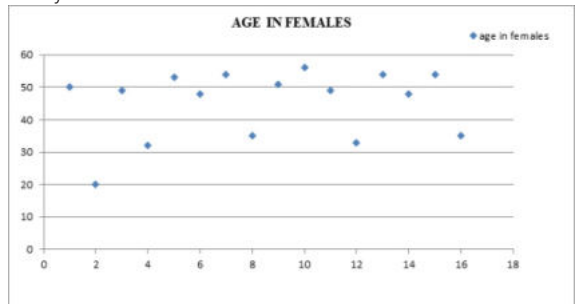


Diagram 6 : The above diagram shows distribution of age among females with mixed pattern of illness.

The age among patient with mixed illness ranged from 20 years to 56 years in females with mean age being 45.58 years.

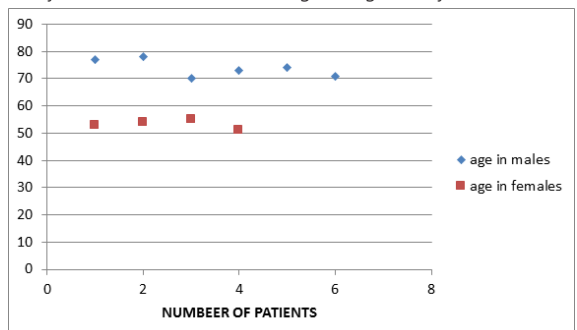


Diagram 7: The above diagram shows the distribution of age of males and females in restrictive pattern of illness. The mean age in males was 74 years while in females it was 53.25 years.

Bacteriological profile: Among 100 sputum samples subject to culture and gram stain study 51 samples failed to show organisms. Pseudomonas (11 samples showing pseudomonas on growth) came out to be the most common organism in the study and was closely followed by Klebsiella, Escherichia coli, Staphylococcus (9 samples each) and Streptococcus (8 samples). Three samples showed the presence of Candida species on Sabrauds agar.

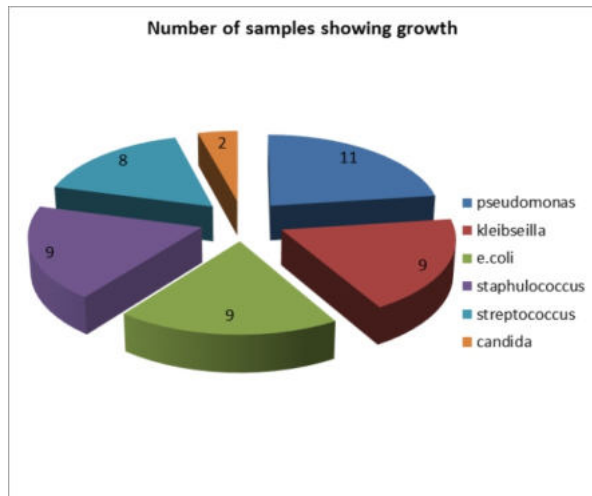


DIAGRAM 8 :The above pie diagram shows the percentage amount of patients with particular bacterial pathogen on there sputum bacteriological profile (gram staining and culture growth).

DISCUSSION

Tuberculosis has a huge disease burden in India. Post-tubercular patients show sequelae despite complete treatment and radical cure. In this present study we have made an attempt to study and correlate spirometry and sputum bacteriological profile among 100 patients of post-tubercular bronchiectasis in central India.

This study showed that the prevalence of disease was more in elderly population with an average age of presentation was 48.16 years and as per study there was more increased prevalence of disease in male population with male to female ratio being 64:36. The age predisposition is in concordance with previous studies like Nicotra et.al.⁵⁷ that had mean age of 57.2 years. In another study Amorium et.al.⁵⁸ mean age was 54 years. Scala et.al.⁵⁹ had concluded in his study that 40% of population of post tubercular bronchiectasis were in the age group of 51-60 years. A possible explanation could be increased incidence of infection, followed by inflammation with increasing age group, causing increased incidence of disease in older age groups.

Although sex predilection was not in concurrence with these studies of Kumar et.al.⁸, Amorium et.al.⁵⁹ and Habesoglu et.al.⁶⁰ which all showed female predominance of the disease.

Spirometric evaluation of patients revealed that the most common pattern of disease was mixed closely followed by obstructive and small number showing restrictive pattern. This was not in accordance with the previous studies of Imam Baig et.al.⁶¹ and Platino study⁶² which had showed obstructive disease as the most prevalent pattern in post tubercular bronchiectasis. However this result was supported by studies of Prabahakar Rao et.al.⁹, who in his study found mixed pattern to be the most common type of involvement in spirometry. Also careful analysis of FEV1 and FEV1/FVC ratio with age group showed that as the age progressed the pattern of involvement progressed from normal to obstructive followed by mixed and restrictive disease which were more common in aged population.

It was observed in our study that the pattern of disease varied with age of individuals, with normal pattern observed commonly in younger age group (mean age being 29.3 years male and 28.38 years female). Obstructive pattern was seen commonly in comparatively early age groups (with mean age of presenting being 48.53 in males and 44.46 in females). As age advances, prevalence of mixed pattern (mean age being 49.52 year male and 45.58 year female) was increased and restrictive pattern was evident in aged population (mean age being 74 year for male and 53.25 years for female. This was according to the previous studies of Brashier et.al.⁶⁴, Baig et.al.⁶¹ and Williox pa et.al.⁶⁵ that concluded increase in severity of disease from increasing age after anti-tubercular therapy Platino study⁶² showed that FEV1 is reduced in comparison to FVC in most cases. However another previous study done by Vargha et.al.⁶³ had found on 15 year follow up that there was higher yearly decline in FVC as compared with FEV1.

Most common organism infecting the respiratory tract is Psuedomonas followed closely by Klebsiella and Escherichia coli. These results were in concurrence with study conducted by Rajashekharan et.al.⁶⁶ and Dimouku et.al.⁶⁷ similar results were seen in studies of and Ho et.al.⁶⁸

Patients with severe disease moderate to severe obstruction showed the predominance of gram negative bacilli showing the facultative anaerobic nature of these organism and there ability to survive and cause pathogenesis in severe obstructive disease. Similar results were also seen in studies of Barker et.al.⁶⁹ and G Davies et.al.⁷⁰. Who also demonstrated that Psuedomonas and gram negative organism were related with severe forms of disease and were associated with increased morbidity.

CONCLUSION

The present observational study was carried out on 100 patients with post-tubercular bronchiectasis to study relation between spirometry and sputum bacteriological profile (including gram staining and culture).

In our study we observed that post-tubercular bronchiectasis patients had a spirometry which showed all the three patterns of disease i.e. obstructive, restrictive, and mixed patterns. There was a predominance of mixed disease and the pattern of disease, closely followed by obstructive pattern and few patients showed restrictive disease. A few cases showed near normal lung functions.

It was also found in the study that the pattern of lung disease (obstructive, restrictive, mixed) was related to age of the patient with majority of patients in younger age showing obstructive lesions. As the age advanced the prevalence of mixed pattern increased and restrictive pattern was more prevalent in older age individuals.

Psuedomonas was the most common organism isolated from the sputum gram staining and culture. It was closely followed by other gram negative bacilli i.e. Klebsiella and Escherichia coli. The gram positive cocci namely Staphylococcus and Streptococcus also caused infections more commonly after the gram negative bacilli. A significant number of samples (51%) showed neither organism on sputum smear staining, nor growth on the culture media.

It was observed that the gram negative bacilli caused infections in patients with reduced FEV1, FVC readings and moderate to severe obstructive disease. In contrast, the gram positive cocci came out to be predominant pathogens in patients with mild to moderate obstruction and relatively preserved lung functions.

This study helps us to determine the empirical therapy in patients of post-tubercular bronchiectasis presenting with exacerbations. Patients with preserved lung functions and mild to moderate disease are more likely to respond when treated with antibiotics targeted against gram positive cocci (like Beta-lactams, Linezolid, Macrolides). While those with progressively deteriorated lung functions and moderate to severe disease need to be treated with antibiotics directed against the gram negative bacteria (like Fluoroquinolones, Aminoglycosides).

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