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Study of Secondary Lung Infections in Newly Diagnosed Pulmonary Tuberculosis

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Abstract
Background: *Tuberculosis (TB) is one of the most highly infectious diseases in India. Secondary lung infection is one of the most important complications in patients with pulmonary tuberculosis. However, very little literature is available regarding secondary lung infections in pulmonary tuberculosis and hence, the need for our study.*
Aims and Objectives: *To determine the pathogenic organisms causing secondary lung infection in newly diagnosed pulmonary tuberculosis and to determine the antibiotic susceptibility pattern among bacterial pathogens*
Methods: *Sputum samples or BAL samples of the patients who are highly suspicious of pulmonary tuberculosis by history, clinical examination and, radiological evaluation has been collected and send for sputum AFB, gram staining, bacterial culture sensitivity and, fungal culture. Only AFB positive samples have been included in the study. Bacteria were identified according to standard microbiological techniques. The results of the gram stain, culture along with culture sensitivity pattern of bacteria has been recorded.*
Results: *Of 100 patients included in the study, 20% of patients have a secondary infection. Among those who have secondary infection 90% is male population and rest 10% only is seen in females. The most common risk factor found to be smoking / Chola inhalation (80 %) and the next common risk factor was found to be diabetes mellitus (55%). 65% of secondary infection was bacterial whereas 35% was found to be the fungal infection. The most common secondary bacterial infection in newly detected pulmonary TB is found to be Klebsiella (53.89%). It is also found to have Gentamycin is the most sensitive antibiotic.*
Conclusion: *In our study, the most common secondary infection is Klebsiella pneumonia and the most effective antibiotic was found to be Gentamycin. Since it was found that 20% of patients have secondary lung infection; we have to send for sputum culture sensitivity for all patients who have been diagnosed with pulmonary tuberculosis and appropriate antibiotic treatment will prevent further complications.*
Keywords: *secondary lung infection, tuberculosis.*

Introduction

Tuberculosis is one of the most contagious diseases in India which is caused by Mycobacterium Tuberculosis[1]. It's an age-old disease and the organism was described by Hermann Heinrich Robert Koch on March 24,

1882, and hence Mycobacterium tuberculosis is also called as Koch's bacilli.[2] It is found that pulmonary tuberculosis patients can have secondary infections but the significance of these potentially pathogenic organisms is uncertain.[3] In certain studies, it has been found that secondary infection in tuberculosis may delay the curing time of tuberculosis and can result in so many complications which include multi-drug resistance[4].

Materials and Methods

Source of Data: Patients who are admitted to the Kempegowda Institute of Medical Science and hospital, Bengaluru with newly diagnosed pulmonary tuberculosis.

Duration of the Study: 18 months (December 2017- May 2019)

Sample Size: 100 subjects

Type of Study: Retrospective study.

Inclusion Criteria

Age> 18 years

Newly detected sputum positive pulmonary tuberculosis
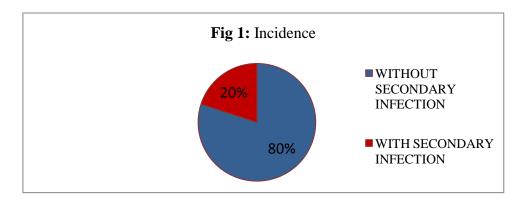
Exclusion Criteria

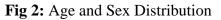Patients already on ATT

Method of Collection of Data

Patients who were admitted with clinical suspicion of tuberculosis with proper history and clinical examination have been asked for sputum AFB. Those cases which were found to have AFB positive ie; newly diagnosed pulmonary tuberculosis has been asked for sputum culture and sensitivity. The results were recorded and analyzed.
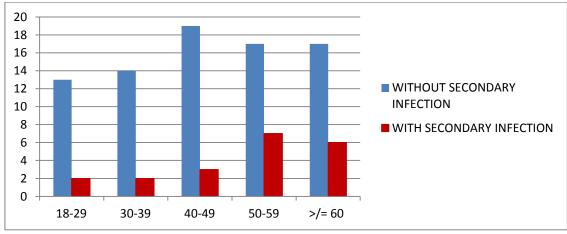
Results

Incidence

Out of 100 subjects who were diagnosed to have pulmonary tuberculosis, only 20 people have been found to have a secondary lung infection. The incidence of secondary lung infection is 20%.

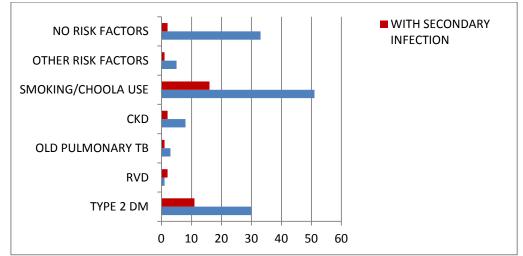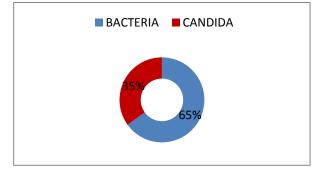**Fig 1:** Incidence

Fig 2: Age and Sex Distribution

It was found in our study that tuberculosis is most commonly seen in males (76%) than in females (24%). It has been found that the ratio of male: female was 18:2, in case of secondary infections.

It has also been found in our study that secondary infections are mostly seen in elderly people >50 years ie; 13 out of 20 people where above 50 years (65%).

Fig 3: Risk Factors

The most common risk factor for secondary infection was found to be smoking / Chola use (80%) of patients and the second most common
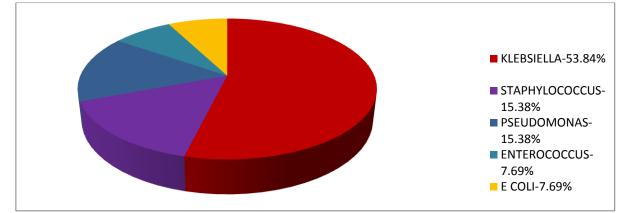
being diabetes mellitus accounting for about 55% of cases.

Fig 4: Secondary Lung Infection

It has been found that out of 100 patients only 20 patients had a secondary infection. Out of the 20 patients who had lung infection 13 patients had bacterial infection whereas 13 patients suffered from fungal infection.

Fig 5: Organism Growth

Among patients who had bacterial infections, it was found that 53.84 % were due to Klebsiella pneumoniae, 15.38% each were due to Staphylococcus aureus & Pseudomonas and 7.69% each were due to Enterococcus and Ecoli.

Table 1: Comparison of Antibiotic Susceptibility

	Staphylococcus	Klebsiella	E Coli	Pseudomonas	Enterococcus
Cefoperazone	100%	42.85%	R	R	R
Ceftriaxone/Tazobactum	R	71.42%	100%	R	R
Cefuroxime	R	28.57%	R	R	R
Cefepime	R	42.85%	100%	R	100%
Cotrimoxazole	R	57.14%	R	R	R
Clindamycin	100%	R	R	R	100%
Cloxacillin	100%	R	R	R	R
Erythromycin	100%	R	R	R	100%
Ciprofloxacin	R	85.71%	R	R	100%
Gentamycin	100%	100%	100%	100%	100%
Levofloxacin	R	71.42%	R	R	R
Linezolid	100%	R	R	R	100%
Tetracyclin	100%	R	R	R	100%
Vancomycin	50%	R	R	R	100%
Amikacin	R	100%	100%	100%	R
Imipenam	R	71.42%	100%	100%	R
Meropenam	R	100%	100%	100%	R
PIP/TAZ	R	85.71%	100%	50%	R

Klebsiella pneumonia, which was the most common isolated organism in a case of newly detected pulmonary tuberculosis was 100% sensitive to gentamycin, amikacin and, meropenem. It has also been found in our study that all organisms which had cause secondary bacterial infection were sensitive to Gentamycin. The most resistant organism in our study was found to be Pseudomonas which was resistant to all antibiotics except gentamycin, amikacin, imipenem, meropenem and, piperacillin tazobactum.

Discussion

Pulmonary tuberculosis can be associated with secondary infection and secondary bacterial infection is one of the most common complications of pulmonary tuberculosis.[5]Our study population included 100 patients who were found to have newly diagnosed pulmonary tuberculosis in which 20% suffered from a secondary lung infection. The major age group who had suffered from secondary lung infection was more than 50 years. Male: female ratio of patients who developed tuberculosis was 74:26 whereas the ratio in patients who developed secondary infection was 18:2.

The most common risk factor for secondary infection in our study was smoking/ Chola use. Smoking or Chola use causes structural changes in the respiratory tract and decrease in immune response which predisposes to secondary lung infection[6]. The other main risk factor was diabetes mellitus which is an immunosuppressive state and hence they are prone for infections.

The most common organism isolated being Klebsiella pneumonia which is Gram - Negative, non-motile bacillus which results in the necrotizing inflammatory process leading to "red currant jelly sputum". Usually, Klebsiella pneumonia causes the cavitary lesion in lung.[7] Tuberculosis itself is an immunocompromised state that can predispose to fungal infection and the fungus which has grown in the culture in our study being Candida albicans.

Gentamycin is an aminoglycoside antibiotic that is being used in the treatment of severe Gram - Negative infections. In our study, we found the most effective antibiotic which can be used in cases of secondary infection in pulmonary tuberculosis is gentamycin. However, the most common side effect of Gentamycin is nephrotoxicity[8].

Zakaria et al., in 2013 studied "on the current Status of secondary Infection of Pulmonary T.B."; found that among 450 TB suspected patients 100 samples were cultured for isolating secondary bacterial infection of newly detected pulmonary TB (PTB) patients whose are already treated by TB drugs. From these cultured samples, 22 were isolated as Klebsiella spp and 10 were isolated as Staphylococus[4].

Table 2: Comparative Study

	Zakaria et al., 2013	Our study
Total number	450	100
Male:Female	68:32	74:26
Culture positive	100	20
Percentage	22.22%	20%
Most common bacterial pathogen	Klebsiella	Klebsiella
Most sensitive antibiotic	Ciprofloxacin, Gentamycin Nalidixic acid	Gentamycin

When compared with Zakaria et al; 2013 it has been found that our study can be compared with their study. The percentage of secondary infection in Zakaria et al was 22.22% whereas in ours the percentage of secondary infection was 20%. The most common organism isolated in both the studies was Klebsiella and the most effective antibiotic was Gentamycin in both the studies.

Limitations

Since we have studied the culture sensitivity in patients who are newly detected to have tuberculosis, it was difficult to say whether the patient was having a secondary infection or the patient was having a co-infection. The other limitations of our study were being a single-center study, short duration and non-assessment of infection whether community or hospital-acquired infection.

Conclusion

In our study, we found that about 20% of newly detected sputum positive pulmonary tuberculosis is associated with secondary infection. Most of the secondary infection was associated with a bacterial infection. Among the bacterias, most were Gram-Negative. Among the Gram-Negative bacterias, Klebsiella was the most common one. All organisms were found to be sensitive to Gentamycin. The most resistant organism was found to be Pseudomonas aeruginosa.

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