



## PREVALENCE OF PSEUDOMONAS CAUSING SECONDARY INFECTION IN PULMONARY TUBERCULOSIS PATIENTS

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### ABSTRACT

**Background:** Secondary bacterial infection is one of the most common complications in pulmonary tuberculosis (PTB) patients. Gram negative bacteria were commonly isolated from from adults hospitalized with secondary bacterial infection. So we conducted this study to assess the prevalence of secondary infection caused by Pseudomonas among active pulmonary tuberculosis patients.

**Materials and Method:** It is a single centre hospital based observational study. 115 pulmonary tuberculosis patients aged above 14 years, with suspicion of secondary infection clinically or having complaints of fever, productive cough, chest pain, shortness of breath, and increased sputum purulence, inspite of taking antitubercular therapy or pulmonary tuberculosis patients with high total leucocyte counts were included.

**Results:** Out of 115 samples sent for sputum pyogenic culture, approximately one fifth (17.39%) were positive for Pseudomonas. Mean age was 46.69 ± 16.40 years in our study.

**Conclusion:** Pseudomonas species are a major cause of secondary bacterial infection in patients with PTB on treatment.

**KEYWORDS :** Pulmonary Tuberculosis, Pseudomonas, Secondary infection, Pyogenic culture.

### INTRODUCTION

Tuberculosis (TB) is one of the common infectious diseases which is caused by infection of bacteria Mycobacterium tuberculosis. Risk factors for TB disease are Human Immunodeficiency Virus (HIV) infection, diabetes mellitus, smoking, alcohol abuse and malnutrition.

Pulmonary TB leads to various complications and secondary bacterial infection is one of the common complications in patients with pulmonary tuberculosis.<sup>1,2</sup> The adverse effect of these infections would be additive on individual's health.<sup>3</sup> Secondary infection is common reason in pulmonary tuberculosis patients for admission to hospitals.<sup>4</sup> There are many pathogenic species which can infect the lungs beside of normal flora of respiratory tract and may produce lesions with tuberculosis.<sup>5</sup> Several pathogenic bacteria found in sputum of TB patients are e.g. Streptococci, Staphylococci, Pneumococci, H. Influenzae, P. aeruginosa, Actinomyces and Diphtheria like bacilli.<sup>6</sup> Streptococcus pneumoniae was frequently identified in previous studies,<sup>7</sup> but Gram negative bacteria were commonly isolated from from adults hospitalized with secondary bacterial infection in recent studies.<sup>7-8</sup> Gram negative bacteria were commonly isolated in abnormal lung architecture following previous TB or respiratory infection.<sup>9-10</sup> Reasons for secondary infection in TB patients are the inhibition of human defense mechanism during the active tuberculosis,<sup>11</sup> T lymphocyte deficiency and hormonal changes such as inhibition of pituitary gland function, high adrenal activity, increased cortisol level and increased pancreatic functional activity during the initial period of tuberculosis. In patients of pulmonary tuberculosis during active course of disease, the alveolar lining material has less bactericidal activity against bacterial infection.<sup>1,12</sup> Secondary bacterial infection in pulmonary TB patients may delay the recovery period of tuberculosis and it will lead to less improvement in patient and ultimately poor patient compliance to treatment that will result in many complications like drug resistance tuberculosis.<sup>13</sup> Infections with other bacteria in patients of TB were associated with poor prognosis.<sup>14</sup>

In pulmonary tuberculosis the opportunistic pathogens not only invade lungs and other organs but also in some cases these organisms increases the severity of the disease. The role of Pseudomonas as opportunistic pathogens in patients with

tuberculosis and AIDS has been increasing.<sup>15-17</sup> Pseudomonas enhances the severity of tuberculosis by causing infections in AIDS patients.<sup>18-19</sup> Some studies demonstrated high prevalence of bacterial co-infection among pulmonary TB patients in HIV endemic countries,<sup>20-22</sup> but studies are lacking in HIV uninfected patients. So this study was done to determine the prevalence of Pseudomonas infection in patients of HIV uninfected pulmonary tuberculosis.

### METHODS:

The study was approved by institutional ethical committee and research review board. This was a hospital based observational study, carried out on 115 pulmonary tuberculosis patients hospitalized in S.M.S Hospital, Jaipur with suspicion of secondary infection. Diagnosis of pulmonary tuberculosis was made by sputum microscopy and CBNAAT. Patients less than 14 year of age, drug resistant TB, extrapulmonary TB and HIV-TB co-infection were excluded from study. Patients with fever, cough, chest pain, shortness of breath, increased sputum production and purulence in spite of taking antitubercular therapy or pulmonary tuberculosis patients with high total leucocyte counts were screened for secondary bacterial infection. Secondary bacterial pathogens were identified by microscopy, colony characteristics and various biochemical tests. Blood Agar, MacConkey's Agar, and Nutrient Agar media routinely used for bacterial culture.

### RESULTS

**Table 1: Socio-demographic variables**

Patient characteristics	Total number (n = 115)
Age in years ( Mean ± SD )	46.69 ± 16.40
<b>Sex</b>	
Male	90 (78.26%)
Female	25 (21.74%)
<b>Body mass index (kg/m<sup>2</sup>)</b>	
Underweight (< 18.5)	97(84.35%)
Normal (18.5-24.9)	18(15.65%)

**Table-2: Distribution of subjects according to Smoking habit**

Addiction Habits	Male n (%)	Female n (%)	Total n (%)
Current Smoker	41 (35.65%)	0 (0.0%)	41 (35.65%)
Ex Smoker	28 (24.35%)	3 (2.61%)	31 (26.96%)

**Table-3: Distribution of subjects according to previous history of ATT**

Type of Case	Previous History of ATT	Number	Percentage
New	No	54	46.96
Recurrent PTB	Yes	61	53.04
	<b>Total</b>	<b>115</b>	<b>100</b>

**Table-4: Distribution of subjects according to Gram's staining of sputum**

Gram's Staining of Sputum	Male n (%)	Female n (%)	Total n (%)
Gram Positive Cocci	39 (33.91%)	11 (9.57%)	50 (43.48%)
Gram Negative Bacilli	41 (35.65%)	9 (7.83%)	50 (43.48%)
Others	10 (8.70%)	5 (4.35%)	15 (13.04%)
<b>Total</b>	<b>90 (78.26)</b>	<b>25 (21.74)</b>	<b>115 (100)</b>

In our study we found that *Pseudomonas* species were isolated in 20 (17.39%) subjects out of 115 patients in pyogenic culture of sputum.

**DISCUSSION**

The age range of study population was between 15-78 years. Mean age group of patients was 46.69 ± 16.40 years in our study. Mean age was 35.98% ± 15.93% in the study conducted by G. Ilyasu et al.<sup>23</sup>

In our study 78.26% patients were male and 21.74% were female. Most patients (84.35%) were in underweight category. Mean BMI was 16.01±2.45 kg/m2. Smoking has been associated with increased risk of tuberculosis and lower respiratory tract infection. 62.61% subjects in our study were having smoking history including 35.65% patients were current smokers and 26.96% patients were Ex Smoker.

We observed that 53.04% patients had history of antitubercular treatment in past and 46.96 % patients were new cases. In Recurrent PTB patients, we found that 30.43% patients took ATT for once in past and 22.61% patients received antitubercular treatment for 2 times or more than 2 times. The reason for same is that *Pseudomonas* infections are common in already damaged lungs.

In our study we found 20 (17.39%) isolates of *Pseudomonas*. These findings are similar to the study conducted by Langbang et al.<sup>1</sup> 16% subjects were infected with *Pseudomonas* in their study. Mujahid et al.<sup>24</sup> found that in 14% patients of tuberculosis, *Pseudomonas* was the cause for secondary bacterial infection. 23% and 28% patients of pulmonary tuberculosis were co-infected with *Pseudomonas* species in study conducted by Attia et al.<sup>3</sup> and Gohil et al.<sup>25</sup> respectively. In the study conducted by Hasan et al.,<sup>2</sup> they observed *Pseudomonas* (35.1%) as commonly isolated organism in pulmonary TB patients. Shashi Bhushan et al.<sup>26</sup> found that in pulmonary TB patients secondary infection with *Pseudomonas* was found in 9.33% subjects.

**CONCLUSION**

This study highlights the significance of *Pseudomonas* as a probable cause of secondary infection in patients with active PTB. The role of *Pseudomonas* as opportunistic pathogen which causes secondary infection in patients of tuberculosis has been increasing.

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