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Socio-Demographic and Clinical Findings between Pulmonary Tuberculosis and Bacterial Pneumonia

Dr. Tanzila Ferdous[1*], Prof. Dr. Md. Titu Miah[2], Dr. Faisal Bin Yousuf[3], Dr. Sayeda Moni Chowdhury[1], Dr. Sayat Quayum[4]

[1]Assistant Professor, Department of Medicine, International Medical College, Tongi, Dhaka, Bangladesh
[2]Professor of Medicine, Acting Director General of Directorate General of Medical Education, Bangladesh
[3]Junior Consultant, Medicine, Upazila Health Complex, Manikgonj, Bangladesh
[4]Specialist, Internal Medicine, Evercare Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Tanzila Ferdous
Assistant Professor, Department of Medicine, International Medical College, Tongi, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: Pulmonary tuberculosis (PTB) is a chronic infection of the lung caused by Mycobacterium Tuberculosis. On the other hand, bacterial pneumonia is another potentially fatal infection of the lower respiratory tract caused by various bacteria. In diagnosing and treating those diseases, a clear concept of the clinical features of those diseases is very important. ***Aim of the study:*** To assess the socio-demographic and clinical features between pulmonary tuberculosis and bacterial pneumonia patients in Bangladesh. ***Methods:*** This was a descriptive cross-sectional study that was conducted in the Department of Medicine, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, from March 2018 to September 2020. Confirming by proper investigations, 100 pulmonary tuberculosis (PTB) patients in group I and 100 bacterial pneumonia patients in group II were taken as the study subjects. A purposive sampling method was used in subject selection. Collected data were encoded as well as inputted into SPSS software 16.0 programs and analyzed. Categorical data were presented as frequency and percentage; continuous data were presented as mean ± standard deviation (SD). In all cases, a P-value <0.05 was considered statistically significant. ***Results*:** The mean age of group I patients was 42.59 ±12.73 years, while in group II, patients were 54.02±9.49 years. In analyzing the signs and symptoms of the patients in both groups, we observed that 100% of PTB patients had cough while 81% had sputum, 73% had fever, and 46% had weight loss. Among pneumonia patients, 94% had a fever, 91% had a cough, 58% had sputum and 56% had chest pain. In comparing the ESR, CRP levels, Mantoux test results between group I (Pulmonary tuberculosis) and group II (Bacterial pneumonia), we found statistically significant correlations. ***Conclusion:*** Cough sputum and fever are common symptoms for both pulmonary tuberculosis and bacterial pneumonia patients, but weight loss was a symptom of pulmonary TB. ESR levels, CRP levels, and Mantoux test results may significantly differ between the mentioned two diseased patients.

Keywords: Clinical features, TB, Pulmonary tuberculosis, Bacterial pneumonia, Cough.

INTRODUCTION

Worldwide, tuberculosis (TB) is one of the leading causes of mortality and has become a global public health emergency [1]. Tuberculosis (TB) is caused by the bacteria Mycobacterium tuberculosis that most often affects the lungs resulting in pulmonary tuberculosis and spreading from person to person through the air by sneezing, coughing, and spitting, affecting people of both sexes among all age groups [2]. Pulmonary tuberculosis (PTB) is usually a chronic airborne infection of the lung caused by the bacteria, Mycobacterium tuberculosis [3]. In another study [3], it was also reported that PTB is a typical chronic consumptive disease, but it can present as an acute pneumonia. In fact, bacterial pneumonia is one of the major infection-related causes of death in the world [5]. These diseases have similar symptoms-sputum production, cough, dyspnoea, fever, and abnormal auscultatory findings [6]. The clinical symptoms of acute tuberculosis (TB) are similar to those of non-tuberculous bacterial pneumonia. Patients with M. tuberculosis infection have lung damage so they may be at a higher risk of pneumonia. [7]. The incidence of pneumonia in PTB cases is higher than that in normal groups. The study [8], reports an incidence of pneumonia to be 1.9-fold higher in the pulmonary tuberculosis (PTB) cohort compared to the PTB-free cohort (51.6 vs. 27.0 per 1000 person-years). A complete evaluation for tuberculosis

must include a physical examination, a medical history, a chest radiograph, and microbiologic smears and cultures. It may also have a tuberculin skin test and a serologic test. A recent study, analyzing medical records from six medical centers, provides strong evidence of the simultaneous occurrence of pulmonary tuberculosis (PTB) in patients with pneumonia [9]. In a Korean study using hospital records, 66 out of 90 PTB patients undergoing mechanical ventilation for acute respiratory failure were diagnosed with tuberculous pneumonia, while 24 cases exhibited miliary TB [10]. These findings indicate that PTB patients experiencing acute respiratory failure are more susceptible to complications involving pneumonia development. Clinical data from these studies highlight a significant association between PTB and pneumonia, indicating that TB patients face an increased risk of pneumonia development. Another study by Lin *et al*., [11], based on medical records of 2016 tuberculosis patients at medical centers, identified pneumonia as the most common predictor (39.5%) among 43 cases of tuberculosis-related mortality. The objective of this current study was to assess the clinical features between pulmonary tuberculosis and bacterial pneumonia patients.

METHODOLOGY

This was a hospital-based descriptive cross-sectional study that was conducted at the Department of Medicine, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, from March 2018 to September 2020. Confirming by proper investigations, 100 pulmonary tuberculosis (PTB) patients in group I and 100 bacterial pneumonia patients in group II were taken as the study subjects. A purposive sampling method was used in subject selection.

Inclusion Criteria

Group I

- The patient's age was 18 to 65 years.
- Sputum smear microscopy positive for acid-fast bacilli (AFB) or Xpert MTB/ RIF positive
- Radio-logically, lung parenchymal abnormalities – like diffuse patchy opacity/consolidation /cavitary lesion, etc.
- Clinical symptoms of active pulmonary TB - cough for 3 weeks or more, hemoptysis, fever, loss of appetite, weight loss, night sweats (Any two)

Group II

- The patient's age was 18 to 65 years.
- Radiological evidence of consolidation
- Clinical symptoms of pneumonia, cough, fever, expectoration-mucopurulent, hemoptysis, (rusty color), pleuritic chest pain (Any two)
- With or without sputum smear positive for bacteria or culture positive
- Sputum smear-negative for acid-fast bacilli (AFB) or Xpert MTB/RIF negative.

Exclusion Criteria

- History of previous pulmonary or extra pulmonary TB or on-going TB treatment.
- Patients with known liver, renal or cardiac diseases, any known pulmonary disease other than pneumonia or PTB.

Ethical implication

The study was approved by the ethical committee of the mentioned hospital. Properly written consent was taken from all the patients before data collection. The whole intervention was conducted following the principles of human research specified in the Helsinki Declaration [12], and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR) [13]. All the necessary diagnosis was performed in DMCH, Dhaka, Bangladesh. All data were collected in the semi-structured case record form. During the collection of data, the highest standard of ethical measures was ensured and maintained throughout the study. Collected data were encoded as well as inputted into SPSS software 16.0 programs and analyzed. Categorical data were presented as frequency and percentage; continuous data were presented as mean ± standard deviation (SD). In all cases, a P-value <0.05 was considered statistically significant.

RESULTS

In this study, the male was the predominant gender in both groups I and II (73.0% and 61.0%, respectively). Among the total of our patients, the majority of pulmonary tuberculosis patients belonged to the 41-50 year's group (30.0%), while the majority of bacterial pneumonia patients were from the 51-60 years group (41.0%). The mean age of group I patients was 42.59 ±12.73 years, while in group II, patients were 54.02±9.49 years. The majority of patients in both Group I (pulmonary TB) and Group II (bacterial pneumonia) belonged to the middle-income status, accounting for 51.0% and 54.0%, respectively. In analyzing the signs and symptoms of the patients in both groups, we observed that 100% of PTB patients had cough while 81% had sputum, 73% had fever, and 46% had weight loss. Among pneumonia patients, 94% had a fever, 91% had a cough, 58% had sputum and 56% had chest pain. ESR level in group I showed 67% had between 50-100 mm in 1st hour and 15% had >100 mm. Among group II patients, 79% had ESR <50 and 21% had between 50-100 ($p<0.001$, determined by chi-square test). CRP level in group I showed 67.0% had <50 mg/L and 33.0% had 50-100 mg/L. Among group II patients, 55.0% had CRP 50-100 mg/L, 35.0% <50 mg/L, and the rest 10.0% >100 mg/L ($p<0.001$, determined by chi-square test). The

Mantoux test showed that 67% of group I were positive and 43% negative, while all patients in group II had negative MT test values (p<0.001, determined by the chi-square test). About 34% of group, I patients had positive sputum smear microscopy examination for AFB, 66% had positive Xpert MTB/RIF and 15% had positive gram staining. In group II, 49% had positive sputum Gram staining. Among group I patients, 40% had patchy opacity in the X-ray chest, followed by 28% had upper lobe consolidation, while among group II patients, 100% had consolidation in different lobes in chest X-rays.

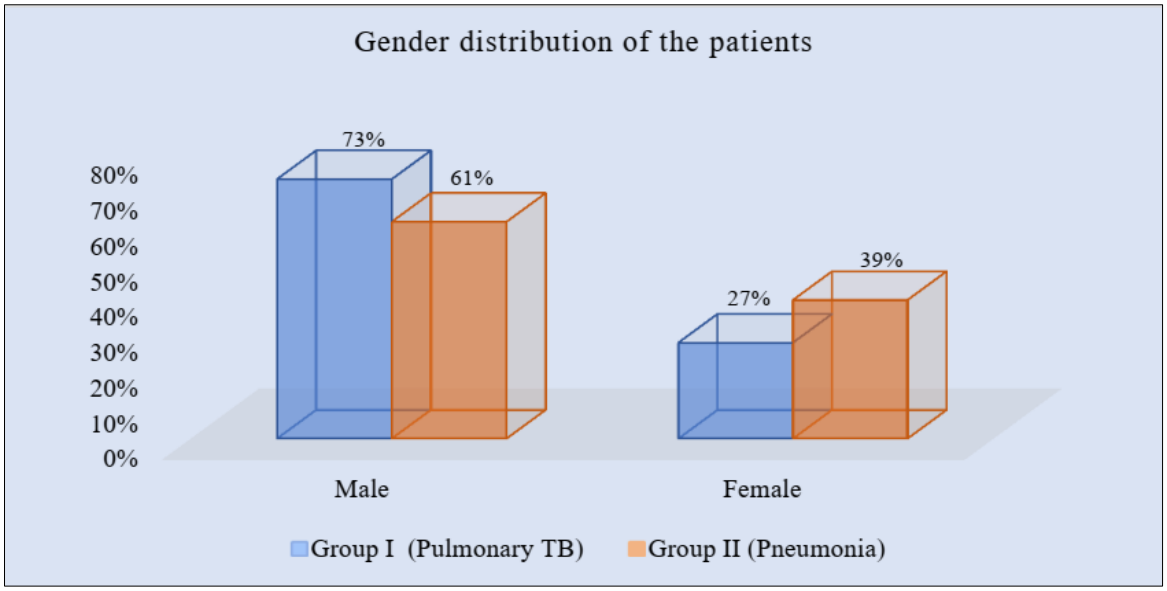

Figure I: Column chart showed gender-wise patient distribution. (N=200)

Table I: Distribution of patients according to age group (N=200)

Age Group	Group I (Pulmonary TB) n (%)	Group II (Pneumonia) n (%)	P-value
18-30 yrs.	18(18.0%)	0	<0.001
31-40 yrs.	25(25.0%)	9(9.0%)	
41-50 yrs.	30(30.0%)	22(22.0%)	
51-60 yrs.	21(21.0%)	41(41.0%)	
>60 yrs.	6(6.0%)	28(28.0%)	
Mean age (years)	42.59±12.73	54.02±9.49	

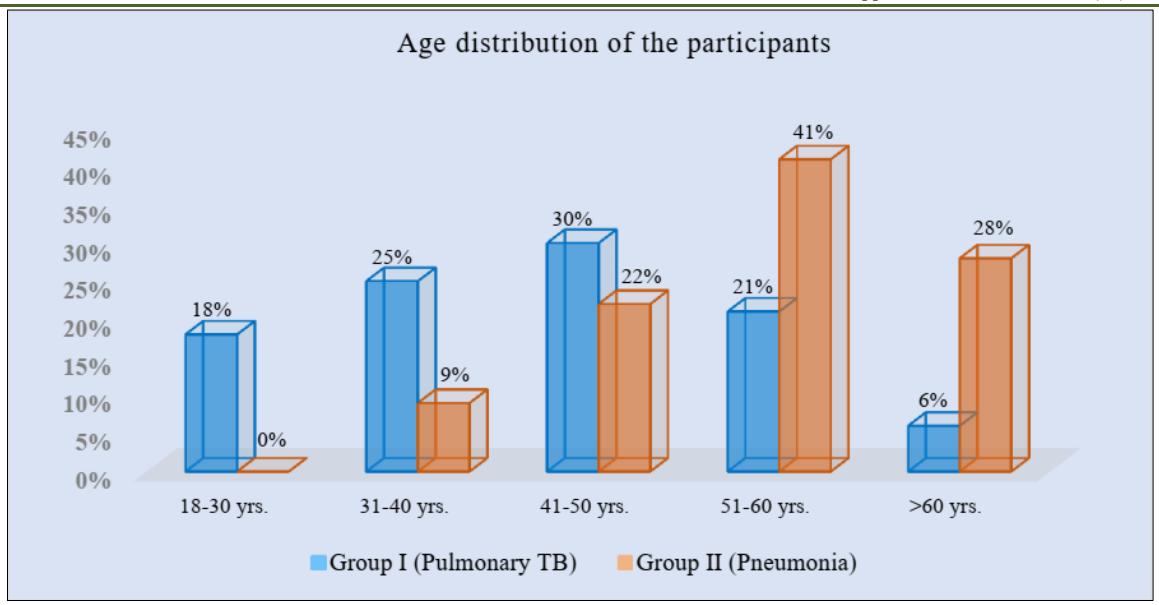

Figure II: Column chart showed age-wise patient distribution. (N=200)

Table 2: Distribution according to occupation (N=200)

Occupation	Group I (Pulmonary TB) n (%)	Group II (Pneumonia) n (%)	P-value
Housewife	15 (15.0%)	29 (29.0%)	0.017*
Service holder	30 (30.0%)	27(27.0%)	
Small business owners	21 (21.0%)	19 (19.0%)	
Cultivators	16 (16.0%)	15 (15.0%)	
Unemployed	9 (9.0%)	10 (10.0%)	
Student	9 (9.0%)	0 (0.0%)	

***P value measured by chi-square test**

Table 3: Distribution of study population according to socio-economic status (N=200)

Socio-economic status	Group I (Pulmonary TB) n (%)	Group II (Pneumonia) n (%)
low income	46 (46.0%)	41 (41.0%)
Middle income	51(51.0%)	54 (54.0%)
High income	3(3.0%)	5(5.0%)

***P value measured by chi-square test**

Table 4: Sign-symptoms of the patients (N=200)

Clinical features	Group I n (%)	Group II n (%)
Cough	100(100.0%)	91 (91.0%)
Sputum	81 (81.0%)	58 (58.0%)
Fever	73 (73.0%)	94 (94.0%)
Weight loss	46 (46.0%)	0 (0.0%)
Chest pain	24 (24.0%)	56 (56.0%)
Shortness of breath	25 (25.0%)	57 (57.0%)

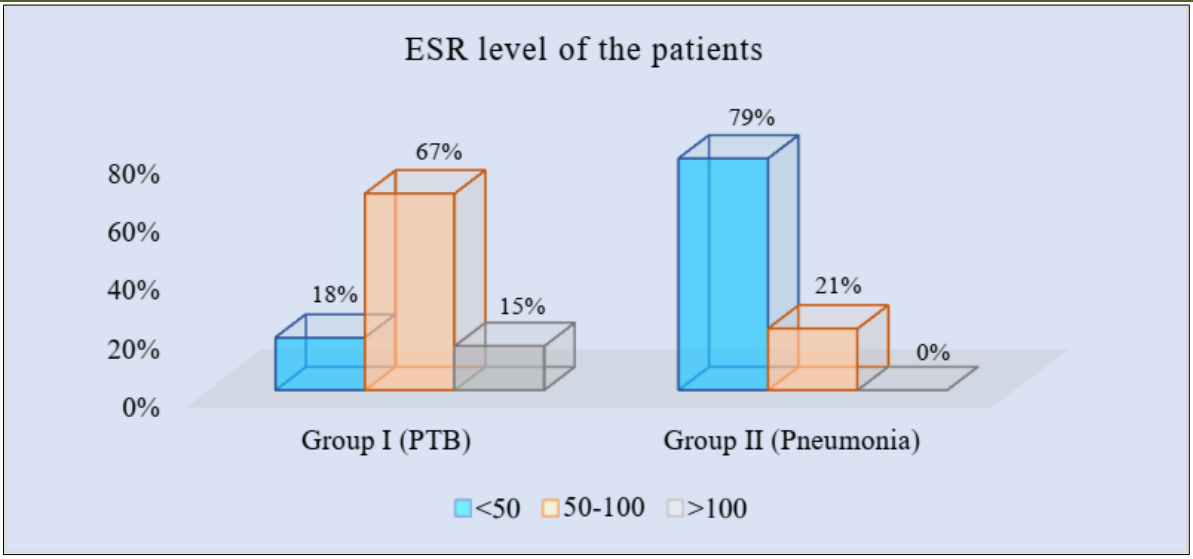

Figure III: Column chart showed ESR levels wise patients distribution (N=200)

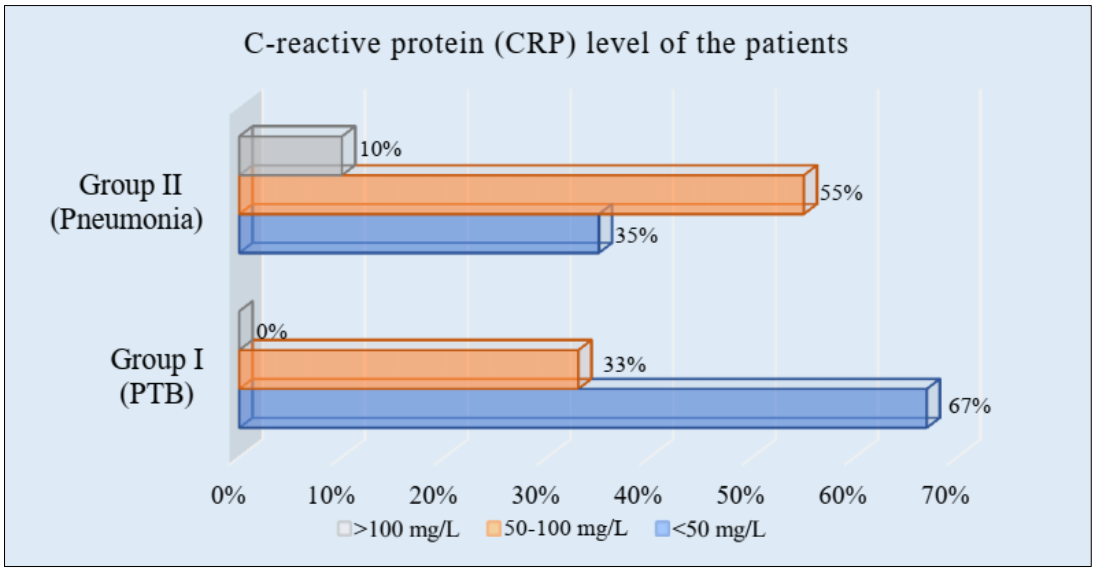

Figure IV: Bar chart showed CRP levels wise patients distribution (N=200)

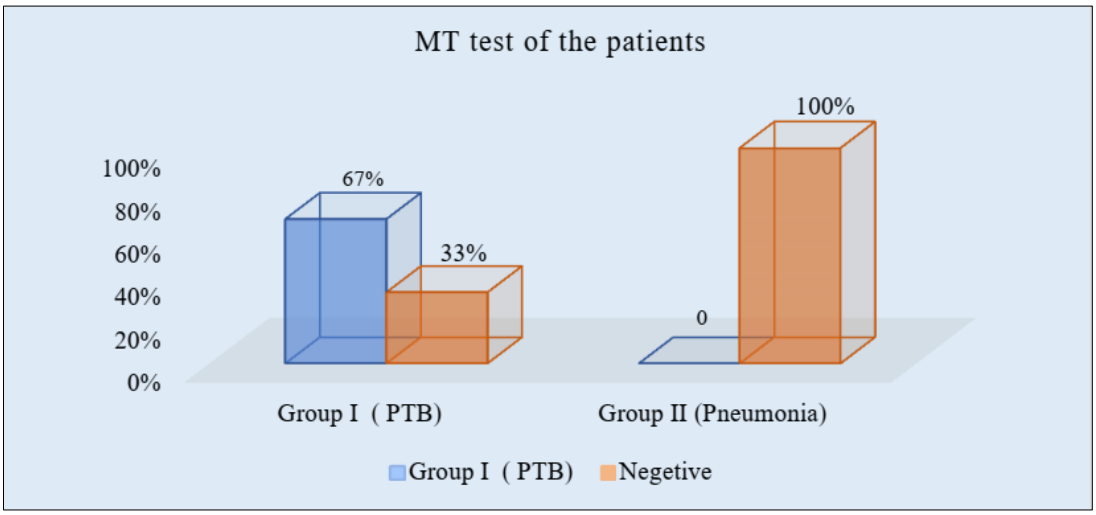

Figure V: Column chart showed Mantoux test levels in different groups of patients. (N=200)

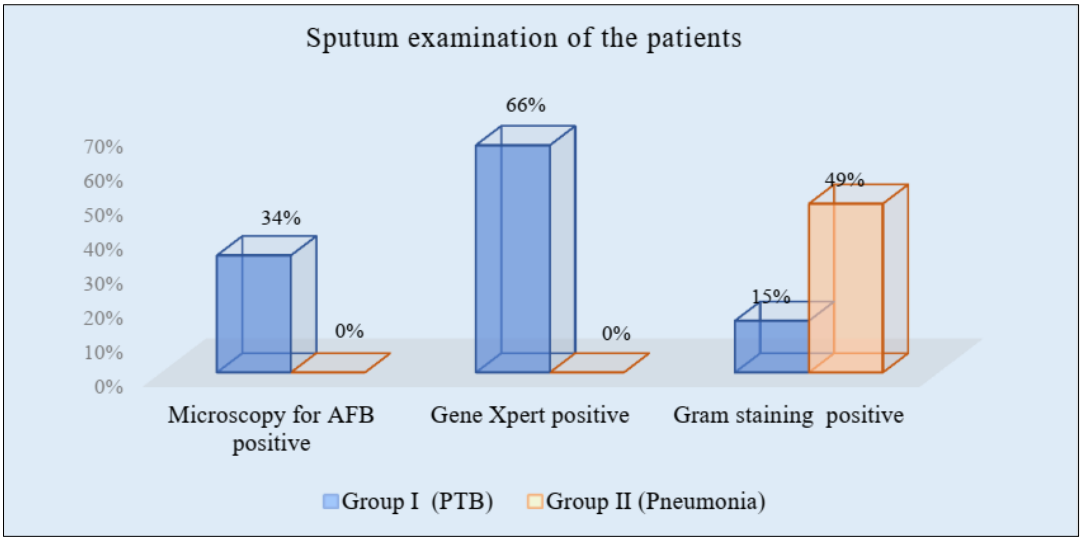

Figure VI: Column chart showed sputum examination among different groups of patients (N=200)

Table 5: X-ray findings in the patients (N=200)

X-ray findings	Group I n (%)	Group II n (%)
Chest X-ray findings		
Patchy opacity	40(40.0%)	0(0.0%)
Consolidation in a different lobe	22(22.0%)	100(100.0%)
Cavitary lesion	7(7.0%)	0(0.0%)
Upper lobe consolidation	28(28.0%)	0(0.0%)
Others	3(3.0%)	0(0.0%)
Additional Chest X-ray findings		
Pleural effusion	10(10.0%)	45(45.0%)
Collapse	8(8.0%)	0(0.0%)
Lymphadenopathy	20(20.0%)	0(0.0%)

DISCUSSION

This study aimed to assess the socio-demographic and clinical features between pulmonary tuberculosis and bacterial pneumonia patients. Diagnosing pulmonary tuberculosis remains dependent upon chest radiography, sputum smear microbiological evidence, and clinical sign symptoms. Currently, 57% of global tuberculosis patients are being diagnosed bacteriologically [14]. However, in some cases of PTB, Acid Fast Bacilli stains in sputum samples may be negative/respiratory specimens may not be available [15]. Certain pulmonary tuberculosis (PTB) patients exhibited non- typical symptoms and unconventional chest imaging, often being misinterpreted as bacterial pneumonia upon admission. This misinterpretation has resulted in delayed diagnoses and the isolation of PTB patients [16]. In this study total number of respondents was 200. Among them, in 100 patients with pulmonary tuberculosis, the majority of respondents were aged between 41-50 years (30.0%), followed by 25% in 31-40 years with a mean age of 42.59±12.73 years. Among 100 pneumonia patients, the majority were in the age group of 51-60 years (41.0%), followed by 28% in >60 years with a mean age of 54.02±9.49 years. A hospital-based study in India reported that about 72.5% of cases of PTB were >40 years of age [17]. Another study showed that 61.7% of patients with pulmonary tuberculosis (PTB) were within the age group of 15 – 34 years [18]. Among infected persons, the incidence of tuberculosis was highest during late adolescence as well as early adulthood; the reasons are unclear [19]. In this study, most patients in both Group I (pulmonary TB) and Group II (bacterial pneumonia) were classified as middle-income individuals, comprising 51.0% and 54.0%, respectively. In a study [20], it was reported that lower socio-economic status is associated with an increased risk of TB in Asia. Cough was the predominant clinical feature found in 100% of patients, followed by 81% sputum, 73% fever, and 46% weight loss. Sajith *et al*., [18], reported that cough with expectoration was prevalent in 96.5% of cases, followed by weight loss (80.7%), fever (73.7%), and loss of appetite (54.4%). ESR was in the level of 50-100 mm in 1st hour in 67%

of PTB cases,15% had >100 mm and in pneumonia, it was only 21% had ESR in 50-100 mm. Mandal and Chavan (2016) [21], reported ESR was elevated in 87 (87%) and normal in 26 (26%) of PTB patients. The mean ESR level in all patients was 67.6 mm/hr. 55.0% of pneumonia patients had CRP levels between 50-100 mg/L compared to 33% in PTB. In total, 92% of pneumonia patients had elevated CRP with a median value of 65 mg/L found in a study by Lagerström, Engfeldt, and Holmberg (2006) [22]. About 67% had Mantoux test positive in PTB cases, with 100% negative in the pneumonia group. Sputum examination revealed that in total, 34% had sputum smear microscopy positive for AFB, and 66% had sputum Xpert MTB/RIF positive for AFB in the PTB group. On the other hand, X-ray findings revealed that 40.0% of cases had patchy opacity, 28.0% of cases had upper lobe consolidation, and 100% of patients with pneumonia had consolidation in different lobes.

Limitation of the Study

This was a single-centered study with small-sized samples. Moreover, the study was conducted over a very short period. So, the findings of this study may not reflect the exact scenario of the whole country.

CONCLUSION & RECOMMENDATION

As per the findings of this current study, we can conclude that cough, sputum and fever are common symptoms for both pulmonary tuberculosis and bacterial pneumonia patients. But weight loss is associated with pulmonary tuberculosis. ESR levels, CRP levels, and Mantoux test results may significantly differ between the mentioned two disease patients and guide to diagnosis. To get more specific results, we would like to recommend conducting similar studies in several places with larger-sized samples.

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