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Original Research Article

A Study On The Clinical Profile Of Patients Who Are Clinically Suspected To Have Pulmonary Tuberculosis At A Tertiary Care Centre

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ABSTRACT

The initial step in the diagnosing of PTB is by sputum microscopy and chest radiography under the National Tuberculosis elimination program (NTEP) in patients with presumptive Koch. Examination of the sputum smear is very simple and remains very economical as only minimum training of the technician is needed, and is available in most of the healthcare facilities, free of the coast and is less cumbersome to the patients because of the availability of the results on the very same days. Patients who had less than 1 ml of sputum were defined as having poor sputum- scarce disease. A confirmed case of pulmonary tuberculosis was one in which Mycobacterium tuberculosis (MTB) grew on mycobacterial cultures by solid or liquid culture medium, which was taken as the gold standard. Patients of either gender aged above 12 years of age, that had suspected pulmonary tuberculosis on clinical or radiological grounds, were included in the study. Smear-positive cases, those with disseminated or extrapulmonary tuberculosis patients were excluded from the study. Majority of the study subjects had a cough, 81.3% had expectorations, 82.5% subjects had a loss of appetite, 68.8% had a loss of weight, 36.3% subjects had dyspnea, 18.8% subjects had hemoptysis, 63.8% subjects had evening rise in temp.

Keywords: Pulmonary tuberculosis, Fluorescent microscopy, Sputum smear-negative for PTB

INTRODUCTION

Tuberculosis is a very ancient disease and being highly infectious, it has the potential to affect any organ or system. It remains a serious health challenge that humans face globally. According to the WHO Global Tuberculosis Report 2018, "globally, tuberculosis is one of the 10 leading causes of death". And the leading cause by a single infectious agent". In 2017, TB caused approximately 1.3 million deaths among HIV-negative people and an additional 300,000 related deaths from TB among HIV-positive people. Quick, timely, and precise diagnosis is a very important first step in the control of Tb and MDR-Tb. Using sub-optimal diagnostic methods makes this task more difficult. Quick and early detection is needed to disrupt the transmission and reduce the death rates, particularly for the detection of drug-

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resistant forms and in people infected with the human immunodeficiency virus (HIV). Detection of acid-fast bacilli (AFB) in the sputum smear of the patient remains the mainstay of diagnosis of pulmonary tuberculosis (PTB) [1].

The initial step in the diagnosing of PTB is by sputum microscopy and chest radiography under the National Tuberculosis elimination program (NTEP) in patients with presumptive Koch. Examination of the sputum smear is very simple and remains very economical as only minimum training of the technician is needed, and is available in most of the healthcare facilities, free of the coast and is less cumbersome to the patients because of the availability of the results on the very same days. The disadvantage is that, a minimum requirement of the presence of at least 5000-10,000 acid-fast bacilli (AFB) per mm of sample for it to be able to detect mycobacterium. "It has low sensitivity (22-82%), a high specificity (99-99.9%), false-negative reporting of 17.6 to 78%, and is unable to detect drug resistance". Also if their Low bacilli load, results in smear-negative PTB, an area of the diagnostic dilemma that causes a delay in diagnosis and causes continued transmission of TB [2].

Fluorescent microscopy (FM) is an alternate approach to Zeihl-Nelson (ZN) smear microscopy, with sensitivity 8-10% higher than ZN smear and an added advantage is that the acid-fast bacilli can be observed at a lower magnification of 40x, and the time required for examining the smear is about 2/3rds of that needed for ZN staining method. The WHO recommends ZN microscopy be phased out and replaced with LED FM for the diagnosis of TB [3].

In the case of smear-negative cases, WHO recommends culture of the sputum for mycobacterium plus chest radiography. In about 27% of patients who were sputum smear-negative for AFB cultures for mycobacterium turned out to be positive. In another very similar, but significant study, 48% of patients who were sputum smear-negative for AFB cultures for mycobacterium were found to be culture positive. It was also observed that in patients who were empirically started on ATT, cultures were positive only in 38% of the cases. About 17% of the patients deemed to be smear-negative, culture-positive patients were proven to transmit the disease. In immune-compromised patients, especially those infected by HIV-PTB co-infection, false negativity of the smear examination for acid-fast bacilli was higher anywhere from 24-61%. All of the above factors add to the difficulty to make a definite diagnosis, in patients with a presumptive TB who turns out to be sputum smear-negative for AFB [4].

Even though the Gold standard is culture mycobacterial culture (Lowenstein-Jensen medium or Middle-brook medium), which remained a mainstay of diagnosis, this lead to very considerable delay up to 4 weeks with an additional time required for drug susceptibility testing, hampering the patients care and outcome. A newer modality liquid culture i.e. Mycobacterial Growth Indicator Tube (MGIT), is a faster method that provides results in 2 weeks but needs a well-trained microbiologist, expensive infrastructure, and strict bio-safety requirements which are not feasible at peripheral health care facilities in India.

Methodology

A patient of tuberculosis-suspect, based on clinical and radiological features, compatible with a diagnosis of pulmonary tuberculosis. A smear-negative case was one in which two consecutive early morning sputum samples did not reveal acid-fast bacilli when examined by microscopy with Zeihl-Nelson stain. Patients who had less than 1 ml of sputum were defined as having poor sputum-scarce disease. A confirmed case of pulmonary tuberculosis was one in which Mycobacterium tuberculosis (MTB) grew on mycobacterial cultures by solid or liquid culture medium, which was taken as the gold standard. Patients of either gender aged above 12 years of age, that had suspected pulmonary tuberculosis on clinical or radiological

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grounds, were included in the study. Smear-positive cases, those with disseminated or extrapulmonary tuberculosis patients were excluded from the study. Following written consent for bronchoscopy, demographic and clinical data were collected. Bronchoscopy was performed by trans nasal route and bronchoscope was wedged into the sub-segmental bronchus of interest and Bronchial wash was obtained by instillation of sterile normal saline. It was sent for ZN stain and mycobacterial liquid culture (gold standard), for CBNAAT to detect Mycobacterium tuberculosis (MTB), and rifampicin resistance.

Inclusion criteria

1. Patients who are clinically suspected to have pulmonary tuberculosis, including those who have symptoms of cough with or without expectoration for >2 weeks, weight loss, fatigue, hemoptysis, and loss of appetite with sputum smear-negative for PTB.
2. Patients with radiological features suggestive of pulmonary tuberculosis with smear-negative for PTB.
3. Patients unable to expectorate mucoid sputum after induction with 3% NaCl solution.
4. Patients who are willing to get involved in the study.

Exclusion criteria

1. Microbiologically positive TB patients.
2. Patients who are unfit for FOB (severe asthma, recent MI bleeding disorders).
3. Isolated extra-pulmonary tuberculosis.
4. RVD positive patients.

Study design

Prospective cross-sectional Descriptive study

Sample size: 80.

Study protocol

From patients attending the thoracic medicine OPD, and patients admitted in wards, selected for clinical study as per inclusion/exclusion criteria the following data are collected:

1. Detailed history taking,
2. Complete physical examination,
3. Investigations:

- Complete haemogram.
- Urine routine.
- Random blood sugar.
- CXR.
- Sputum examination for AFB-2 samples (1-spot sample & 1-early morning sample) carried out by ZN staining technique.
- Electrocardiogram (ECG)
- Tests for HIV (ICTC), -HBSag (Hepacard)
- Ancillary specific investigations (where relevant)

i) Computed Tomography-chest,
ii) Monteux test.

4. **Fibre optic bronchoscopy (STORZ 11001BN-1):** Will be used to examine the bronchial tree and obtain-Bronchoalveolar lavage (BAL) fluid, Bronchial washings, mucosal biopsy (if required). The relevant specimens were sent for culture of Mycobacterium tuberculosis

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on Lowenstein-Jensen (LJ) medium, cytological study, and histopathological examination (if required).

Results

Table 1: Distribution of study subjects as per gender

Sex	Frequency	Percent
Female	32	40.0
Male	48	60.0
Total	80	100.0

According to the study the, Distribution of study subjects as per gender was, 48 (60%) of the patients were found to be males and 32 (40%) were found to be females.

Table 2: Distribution of weight and BMI of the study subjects

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
WEIGHT	80	32	78	53.14	9.376
B M I	80	17	31	20.80	2.557

The above table shows the distribution of weight and BMI of the study subjects. The mean weight of study subjects was 53.14±9.376 yrs and the mean BMI of the study subjects was 20.80±2.557.

Table 3: Distribution of the study subjects as per clinical findings

Clinical findings	Frequency	Percent
Cough	80	100
Expectoration	65	81.3
Dyspnea	29	36.3
Chest Pain	13	16.3
Hemoptysis	15	18.8
Evening rise in temperature and night sweats	51	63.8
Loss of APETITE	66	82.5
Loss of weight and generalised weakness	55	68.8

The above table shows the distribution of the study subjects as per clinical findings, majority of the study subjects had a cough, 81.3% had expectorations, 82.5% subjects had a loss of appetite, 68.8% had a loss of weight, 36.3% subjects had dyspnea, 18.8% subjects had hemoptysis, 63.8% subjects had evening rise in temp.

Table 4: Distribution of cough and expectoration in days of the study subjects

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Cough in Days	80	2	180	31.54	30.505
Except oration in Days	65	7	100	27.65	21.884

Table 5 shows the Distribution of cough and expectoration in days of the study subjects. The mean duration of cough was 31.54±30.50 days (2-180 days), and the duration of expectoration was 27.65±21.88 days. (2-100 days).

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Table 5: Distribution of the study subjects as per comorbidity

Comorbidities and Associated Conditions	Frequency	Percent
Nil	47	58.75
T2DM	18	22.5
HTN	4	5
T2DM/HTN	11	13.75
Family history of PTB	20	25
Total	80	100.0

The above table shows the distribution of the study subjects as per comorbidity. 58.75% of subjects do not have any associated co-morbid condition, 22.5% subjects had T2DM, 5% subjects had HTN, 13.75% Had both DM and HTN, 25% subjects had a family history of pulmonary tuberculosis in one of their near family members.

Table 6: Blood investigation of study subjects

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
HB	80	4	16	11.56	2.192
TC	80	4500	29990	11554.76	4971.193
PLT IN LK/CC	80	1	7	3.20	1.174
ESR	80	10	110	44.16	27.091
RBS MG/DL	80	32	467	153.04	81.322
UREA	80	10	125	30.78	17.824
Creatinine	80	0.5	3	.81	.597
Total Bilurubin	80	0	6	.73	.886

The above table shows the Blood investigation of study subjects. The mean HB of the study subjects 11.56 ±2.19, Total count 11554.76±4971.19, Platelet- 3.20±1.17, ESR 44.16±27.09, UREA-30.78±17.82, CREATININE -0.81±0.597, Total bilirubin- 0.73±0.886.

Discussion

The average age is 47.3±17.29 years, with a range of 13-81 years. The M: F ratio was found to be 1.5:1. When compared to a similar study conducted by Panda *et al.* [5], Sanjay awashiya *et al.* [6], this study demonstrated that people aged 50 and up were more susceptible to tuberculosis, with no gender preponderance. Other studies, such as those conducted by Dr. Sakshi Dubey *et al.* [7], Sanjay awashiya *et al.* [6], Panda RK *et al.*, indicated male preponderance, but Khalil's study found female predominance (61.3 percent).

A possible factor for male predominance is that sex hormones can alter Mycobacterial infection susceptibility. In experiments, estrogen protects against Mtb infection by boosting the Th1 immune response and cytokine production. (i.e. TNF, IFN), and macrophage activity that aids in Mtb regulation, another reason being males has more exposure as a result of increased social contact. Males have a higher prevalence of risk factors including smoking and ethanolic, both of which enhance vulnerability to Mtb infection, which may potentially have a role thus explaining why elderly males have a greater infection rate Cough with expectoration was the most common symptom in our study, followed by weight loss, fever, dyspnoea and hemoptysis in similar studies undertaken by Dr. A. Pandiyan *et al.* [8], Vivek N. Iyer *et al.* [9]. 60%. The most prevalent presenting ailment, was cough with expectoration followed by loss of appetite, weight loss, evening rise in temperature dyspnea, chest pain, and hemoptysis.

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The majority of patients in our study had been ill for more than 4 weeks, with a mean length of illness of 31.54 days ranging from 2 days to 6 months. According to a study conducted by Mohan *et al*., the average duration of illness was 10.3 weeks, with a range of 3 to 24 months. Purohit *et al*. study show nearly half of the patients had an illness lasting less than three months and just 15 (30%) had an illness lasting six months.

Diabetes was the most common comorbid condition in the current study, with more CBNAAT positives, extensive lesions and cavitatory lesions on chest x-ray when compared to non-diabetic patients, which is consistent with studies conducted Dr. A. Pandiyan *et al*. [8], MD Eman B Abdel-Fattah [10]. The outcomes of this investigation support the existence of a link between diabetes and the risk of tuberculosis.

Mechanism being, Hyperglycemia-induced poor immunity, including phagocytic dysfunction and decreased T-helper 1-related cytokine response to Mycobacterium tuberculosis, lower T lymphocyte count. In addition to a lower T lymphocyte count, people with diabetes and tuberculosis exhibit lower T cell function (e.g., lower T-helper 1 cytokine level, tumor necrosis factor-production, and interleukin [IL]-1 and IL-6 production) as compared to healthy control participants. Macrophages play a crucial part in TB defense. Diabetes has decreased macrophage activity, particularly phagocytic and bactericidal activities. Diabetic patients also have an expression of the lower insulin receptor and downstream signaling in T cells. Because decreased insulin signaling includes decreased antigen-specific proliferation and proinflammatory cytokine production in T cells, decreased insulin production and altered insulin receptor-mediated signaling in T cells may contribute to an increased risk of tuberculosis in patients with diabetes for a longer period.

Conclusion

- The mean age of the study subjects with 47.38 ± 17.42 yrs, with a minimum age of 13 and maximum age of 81, Most of the patients were above the age of 50 years.
- Male predominance was found in our study with the male is the female ratio of 1.5:1.
- Most of our study subjects were smokers followed by tobacco chewers and Ethanolic.
- The most common symptoms were cough, followed by expectorations, loss of appetite, loss of weight, dyspnea, and hemoptysis.
- The majority of the patients had T2DM as the major comorbid condition and had they were associated with more severe disease and radio logically extensive lesions.

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