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PULMONARY TUBERCULOSIS- ITS EARLY DETECTION AMONGST PATIENTS WITH VARIED SIGNS AND SYMPTOMS

Medical Microbiology

Dr. Ritu Bhatnagar Professor and Head, Department of Microbiology, Pacific Medical College and Hospital, Udaipur, Rajasthan (India).

Dr. Sakshita Agnihotri* Ph.D. Scholar, Pacific Medical College and Hospital, Udaipur, Rajasthan (India). *Corresponding Author

ABSTRACT

Introduction: With nearly one-third of the world's population afflicted Pulmonary Tuberculosis (PTB) continues to be a leading source of death and morbidity globally. Between 10 % and 20% of those who contract the infection, develop active TB, posing a major risk to their health. Patients with pulmonary tuberculosis who exhibit the whole range of symptoms and signs are uncommon in developed nations. Although, health care professionals frequently encounter such incidences in developing nations.[1] **Objective:** To diagnose the proportion of patients presenting with varied symptomatology of Pulmonary Tuberculosis with the help of CBNAAT. **Material And Methods:** Sputum samples were collected from 275 patients with high levels of clinico-radiological suspicion and were processed at diagnostic facilities with CBNAAT testing capabilities in western Rajasthan. **Results:** We discovered that a persistent cough was reported in 87.27% of patients. 69.82% of cases exhibited loss ofweight/loss of appetite. Fever was reported in 65.82% of cases, chest pain in 55.64%, weakness in 49.09%, hemoptysis in 33.82%, myalgia in 20%, contact history of TB in 15.27%, and night sweats in 9.45% of cases. **Conclusion:** Tuberculosis though widely prevalent disease may not always present with classical signs and symptoms and smear positivity in these circumstances we need a reliable method of diagnosis having widespread acceptance. Present study utilized CBNAAT as a promising test for early detection of tuberculosis.

KEYWORDS

CBNAAT, Pulmonary Tuberculosis, Cough, Hemoptysis

INTRODUCTION

For ages, mankind has been plagued by the tuberculosis (TB) disease. *Mycobacterium tuberculosis* is the primary causative agent of this disease in humans, and it is primarily recognized for its effects on the lungs, with pulmonary disease being the most prevalent manifestation. [2] However, TB expresses itself in a variety of ways since it affects multiple systems. The respiratory system, gastrointestinal (GI) system, lymphoreticular system, skin, central nervous system, musculoskeletal system, reproductive system, and liver are the organ systems most frequently impacted. According to the most recent data, there were over 7 million new and relapse TB cases recorded globally in 2018, bringing the total incidence to 10 million, or 133 instances for every 100,000 people. Global mortality in the same year rose to 1.5 million, including 251,000 cases of HIV positivity. [3] With ambitions to reduce TB fatalities by 95% and of fresh cases by 90% worldwide by 2035, the Sustainable Development Goals (SDGs) and WHO's End-TB plan seeks to put an end to the global TB pandemic. [4]

About 7% of all fatalities in developing nations are ascribed to TB, it is by far the most frequent infection-related cause of mortality among adults. [5] In developing nations like Bangladesh, China, Indonesia, Nigeria, Pakistan, the Philippines, South Africa, and our own nation, India, tuberculosis has consistently remained a generational burden for the population to suffer. [6] Despite these commendable commitments, India has by far a very heavy responsibility of TB and also MDR-TB. It has struggled to achieve any significantly high cure rates due to lack of awareness, unavailability of modern and rapid diagnostic methods at grass-root level, lack of trained technicians at remote centers, and many other reasons.

The real prevalence of tuberculosis especially the Pulmonary Tuberculosis (PTB) cases in India is probably higher than the numbers that are currently published. The underreporting of TB cases is basically due to the stigma and unawareness attached to it.[7] The goal of India's National Strategic Plan 2017–2025 is to eradicate tuberculosis in the country. [8]

PTB has non-specific, slowly-evolving clinical signs. Among them include the persistent cough with mucus, pleuritic chest pain, haemoptysis, dyspnoea, wheezing, weakness or progressive tiredness, cachexia/weight loss, loss of appetite (leading in anorexia), chills/fever, night sweats, and malaise. [9,10,11] It has also been related to a number of additional secondary systemic problems, such as elevated oxidative stress and hyponatremia, in addition to these well-known clinical symptoms [12] ,hypocholesterolemia [13] ,intolerance to glucose [14], hematological manifestations [15], vitamin-D deficiency [16] and an altered host microbiota [17] The overall underlying biochemical pathways causing these systemic problems and TB-related symptoms are poorly defined, and the research on this subject is extremely limited. Numerous research groups have used methodologies like metabolomics to acquire new insights into TB disease as a result of recent technology breakthroughs and expanding bioinformatics systems, which have resulted in the development of more powerful research tools. [18] Such studies on the characterization of TB patients' metabolomes have unintentionally, provided a new perspective on the underlying disease mechanisms. [19]

The rapid molecular diagnostic tests, that have high diagnostic accuracy and will result in major improvements in the early detection of TB and drug-resistant TB, are suggested by WHO as the initial diagnostic test for all individuals exhibiting signs and symptoms of TB. WHO also recommends the CBNAAT (Cartridge Based Nucleic Acid Amplification Test) and TrueNAAT assays as rapid and efficient tests.

MATERIAL AND METHODS

a) Study Design: -

This is a prospective study conducted under the guidance of Department of Microbiology at the Pacific Medical College and Hospital in Udaipur, Rajasthan, India. After obtaining Ethical clearance and consent from the Institutional Ethical committee, the study was carried out from 2020 to 2022.
A total of 275 sputum samples were obtained.

Inclusion Criteria:

1. Clinical and radiological characteristics suggestive of pulmonary tuberculosis.
2. Two sputum smear samples from patients who had been clinically suspected of having tuberculosis.
3. Patients providing written informed consent.

Exclusion Criteria:

1. Patients between the ages of 18 and 75.
2. Patients who have received antitubercular therapy for more than one month in the previous six months.
3. HIV-positive individuals.
4. Women who were pregnant and lactating.
5. Suspected cases of extrapulmonary tuberculosis.
6. Patients with diseases related to bleeding disorders, history of myocardial infarction, signs of respiratory or cardiac failure.
7. Uncooperative patients.

Quality control -

In terms of disease detection and containment, a good quality sputum is crucial.

An excellent quality sputum sample is one that contains mucopurulent, and caseous material and is expelled from the lower respiratory tract. For this, a volume of 3-5 ml is adequate.

The PTB patients who had given their consent and were clinically suspected were made to send two sputum samples each.

Both the samples, which were obtained by the patient during his visit to the collection facility were processed for molecular detection of Tuberculosis by CBNAAT. As per the recommendations of the Revised National Tuberculosis Control Program (RNTCP), the samples were submitted for GeneXpert/CBNAAT testing to identify the presence of *M. tuberculosis*.

The samples were taken in pre-sterilized Falcon tubes that were packed three layers deep for security. These were processed in accordance with the Central TB Division's Guidance Document for Use of CBNAAT under RNTCP and the GeneXpert Dx system operator manual.

RESULTS:

- Out of 275 patients which were clinic-radiologically indicative of pulmonary tuberculosis, 262 patients turned out to be positive by CBNAAT method and were timely detected.
- The clinical symptoms observed in all the patients were as shown in **Table 1**.
- The highest proportion of complaints observed were the chronic, persistent cough in 87.27% cases.
- It was followed by the symptoms of Loss of weight/loss of appetite as reported in 69.82% of cases.
- Complaints of fever, chest pain and weakness were observed in 65.82%, 55.64% and 49.09% of cases respectively.
- While a comparatively lower proportion of patients observed symptoms of hemoptysis (33.82%), myalgia (20%), contact history of TB (15.27%) and night sweats (9.45%).

DISCUSSION

Even though determining if a patient is a highly subjective assessment, keeping thorough case history and evaluating the signs, symptoms and chest-radiographs of suspected patients is crucial and helps with the diagnosis. In accordance to our study, Field SK et al(2018) observed chronic cough as the main symptom of patients in their research and recommended screening of such patients for TB in the affected countries.[20]

Many other authors like Lawn SD et al. (2011) supported our findings that chronic cough, loss of appetite and weight, pyrexia, night sweats, hemoptysis and close contact with the infectious individual as some of the traditional clinical signs of pulmonary TB. [21] Luies L. et al. (2020) expressed their viewpoint through their research that prevalence of TB symptoms like cough found in individuals ranging from 42% to 89% and fever from 23% to 68% might probably be attributed to the different individual study groups used in the various investigations. [19]. Apart from the observed signs and symptoms the usage of CBNAAT aided in the quicker diagnosis of PTB cases, which would otherwise have not been initiated a timely treatment had we solely relied on the age-old conventional methods of diagnosis.CC Boehme et al (2011) and Steingart (2014) had the similar views and they appreciated the ability of CBNAAT to diagnose the suspected cases in shorter time and with higher accuracy as compared with sputum microscopy method.[22,23] Some other authors like D Karuna Sagili et al(2018) and Dr. Thammana Sridevi(2019) also echoed the similar thoughts through their findings that in all pulmonary samples CBNAAT showed a greater diagnostic effectiveness than AFB smear. Hence, supporting our choice of a diagnostic test for our study. [24,25]

CONCLUSION-

Although tuberculosis is a common disease, it may not always show traditional signs and symptoms and smear positivity. In these cases, we need a trustworthy diagnostic technique that is universally accepted. The CBNAAT was used in the current investigation as a potential test for early detection of TB. In the present study our patients with single or multiple symptoms which would have been otherwise neglected were able to initiate CBNAAT test which was found to be positive in more than 95% of the cases.

Table 1:- Distribution of cases according to the following symptoms-

Symptoms	number	percentage%
Cough	240	87.27
Loss of weight / Loss of appetite	192	69.82
Fever	181	65.82
Chest Pain	153	55.64
Weakness	135	49.09
Hemoptysis	93	33.82
Myalgia	55	20
Contact history of TB	42	15.27
Night sweats	26	9.45

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