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A NARRATIVE REVIEW ON THE CLINICAL FEATURES OF PULMONARY TUBERCULOSIS

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ABSTRACT

Pulmonary tuberculosis (TB) remains a significant global health concern characterized by a spectrum of clinical features that vary widely in presentation and severity. The disease primarily affects the lungs but can also involve other organs through hematogenous spread. Typical symptoms include chronic cough, often productive, which may be accompanied by hemoptysis in advanced cases. Patients frequently report constitutional symptoms such as fever, night sweats, and unintentional weight loss, reflecting the systemic nature of the infection.

Diagnostic clues often include the presence of a history of exposure to tuberculosis, residence in endemic areas, or immunocompromised status. Physical examination findings can range from normal to signs of advanced disease, including dullness to percussion, crackles, or decreased breath sounds over affected lung fields. Chest radiography remains a cornerstone in the diagnosis, typically revealing infiltrates, cavitations, or miliary patterns depending on the stage and extent of the disease.

Laboratory investigations aid in confirming the diagnosis, with sputum microscopy, culture, and nucleic acid amplification tests playing crucial roles. In cases of extrapulmonary TB, additional diagnostic procedures may be required to identify involvement of other organs. Differential diagnosis includes other causes of chronic cough and respiratory symptoms, necessitating careful clinical evaluation and appropriate testing.

In conclusion, understanding the diverse clinical manifestations and diagnostic strategies of pulmonary tuberculosis is vital for early detection, effective treatment, and prevention of transmission, thereby mitigating its impact on individual health and public health systems worldwide.

INTRODUCTION

Pulmonary tuberculosis (TB) remains a significant global health challenge, characterized by a spectrum of clinical features that reflect the complex interplay between the *Mycobacterium tuberculosis* pathogen and the host immune response (1). Understanding the clinical manifestations of pulmonary TB is crucial for timely diagnosis and effective management, particularly in endemic regions (2).

CLINICAL FEATURES

Pulmonary TB commonly presents with a chronic cough, which may be productive or dry, and is often accompanied by hemoptysis, particularly in advanced stages (3). Systemic symptoms such as fever, night sweats, weight loss, and fatigue are hallmark signs that reflect the systemic inflammatory response and the chronic nature of the infection (4). Dyspnea and chest pain may occur, especially when pleural involvement or extensive pulmonary damage is present (5).

Radiographic findings in pulmonary TB typically reveal infiltrates, cavitations, and nodular lesions predominantly in the upper lobes of the lungs (6). These imaging features, combined with clinical signs and symptoms, guide the diagnostic process, often necessitating further confirmatory tests such as sputum smear microscopy, culture, and molecular diagnostics (7).

A study assessed the geographic distribution and presence of various *M. tuberculosis* strains, in adult pulmonary tuberculosis (PTB), determining its incidence and risk factors in Chennai. The PTB incidence, adjusted for bacterial testing, was determined using direct standardization. Univariate and multivariate analyses identified key risk factors. Distinct *M. tuberculosis* strains were subjected to spotlighting and drug susceptibility testing, with PTB cases mapped via geography. Out of 59,957 eligible individuals, 55,617 were screened based on TB symptoms or X-ray results. Of these, 228 (95%) had positive smear culture and bacteriological results for PTB (8).

The number of individuals with immunosuppressive therapy-related risk factors for tuberculosis has risen. However, data comparing clinical outcomes of immune compromised and non-immune compromised pulmonary tuberculosis is scarce. We analyzed data from 840 pulmonary tuberculosis patients (312 immune compromised and 528 non-immune compromised) tested

positive for *Mycobacterium tuberculosis*. Comparisons revealed that immune compromised patients showed increased respiratory symptoms amid follow-ups to determine underlying disease, more instances of hypo nutrition and negative tuberculin skin test responses, a higher frequency of microbiologically smear-positive sputum specimens, atypical radiological findings (few cavities or calcifications, miliary shadows, mediastinal/hilar lymphadenopathy and bilateral and extensive consolidation), more admissions with incorrectly diagnosed pneumonia, and a higher death rate. It was concluded that many immune compromised patients exhibited unusual radiological features and positive smear results for acid-fast bacilli. Immediate anti-tuberculous treatment is recommended for patients with fever and persistent cough who test positive for acid-fast bacilli (9).

LITERATURE REVIEW

A prospective case-controlled research was done for comparing clinical and imaging characteristics of recurrent PTB cases to newly diagnosed controls. Recurrent PTB was defined as bacteriologically confirmed active PTB in a previously treated and recovered patient, while controls were bacteriologically confirmed PTB patients presenting for the first time. Clinical and radiological features were evaluated, with chi-square and t-tests used to compare proportions and continuous data, respectively. SPSS version 23 facilitated logistic regression analysis and identified factors linked to recurrent PTB. Among 312 PTB patients (104 recurrent and 208 newly diagnosed), hemoptysis was more frequent in recurrent PTB patients (26.9% vs. 16.8%, $p = 0.036$). Chest pain was less common in recurrent PTB cases (31.7% vs. 44.2%, $p = 0.034$). Cavitation was observed more in recurrent PTB (32.7%) in comparison with controls (21.2%, $p = 0.027$). Recurrent PTB had a higher median lung pathology score (50) than controls (30, $p = 0.001$) and were more likely to show mixed restrictive and obstructive lung function patterns (34.6% vs. 14.9%, $p < 0.05$) (10).

In Gambia, a case-control study was performed at Medical Research Council Outpatients clinic to identify PTB risk factors among patients. The study included 100 sputum smear-positive TB cases and 200 age- and sex-matched controls. HIV prevalence was 3.3% in controls and 6.1% in cases. Professional occupation lowered TB risk, while smoking and being from the Jola ethnic group increased it. Environmental risk factors included crowded households, exposure to a known case of TB, and living in home without a ceiling. Combined multivariable model

indicated that crowding in households, exposure to TB case, and Jola ethnic group were primary TB risk factors in The Gambia (11).

A retrospective descriptive study from 2005–2017 and a cohort prospective study from 2018–2020 analyzed pediatric pulmonary TB cases. The retrospective study reviewed 226 patients, identifying key risk factors such as having parents from high-risk countries (60.2%) and contact history (53.5%). Initial symptoms included fever (46%) and cough (49.5%), with persistent symptoms in about 20% of cases. Lymphadenopathy was reported in 15.9% of cases. Another study included 85 patients; 14 (16.5%) with TB, while 71 (83.5%) not. Contact history and lymphadenopathy was strongly correlated with TB diagnosis. Compared to non-TB patients, TB cases were less likely to report prolonged fever and cough but were more likely to have lymphadenopathy and contact history. Persistent fever and cough were less significant in low-TB endemic areas, and other indicators were in-significant risk factors (12, 13).

A study analyzed 232 PTB cases at Kedah Medical Centre, Alor Setar. Pulmonary tuberculosis with male predominance affected all age groups. Risk factors included previous tuberculosis (5.2%), positive family history (16.8%) and diabetes (17.7%). Symptoms persisted for over a year in 45.3% of patients, with only 22% displaying typical tuberculosis symptoms such as weight loss, anorexia, cough and prolonged recurrent fever. Other presentations included chronic cough, bronchiectasis, COPD, hemoptysis, pyrexia of unknown origin, pleural effusion, general ill-health without systemic symptoms. 15 % had extra-pulmonary tuberculosis. Despite 90% having prior medical consultations, 40% had not undergone chest radiographs or sputum examinations. Chest radiographs revealed typical tuberculosis changes in 62% of patients, while 38% had atypical radiological features. Only 22.8% of sputum direct smears tested positive for acid-fast bacilli, and 11.2% were confirmed on basis of positive sputum cultures. Even having typical clinical presentations and radiographic changes, sputum results were often negative. Bronchial washings enhanced diagnostic rates, showing positivity in 49.1% of cases (25.0% by culture and 24.1% by direct smear). In 16.8%, diagnosis was favorable response based depending on empirical anti-tuberculosis therapy in patients having characteristic radiological as well as clinical features. Pulmonary tuberculosis can present with atypical clinical and radiological manifestations. Sputum tests are frequently negative, and diagnostic yield for culturing *Mycobacterium* can be enhanced using bronchoscopy washings. Empirical anti-

tuberculosis therapy should be considered in highly probable cases as it is both safe and beneficial (14).

An observational study from 2015 to 2018 in lung disease and regional TB hospitals in China included all newly diagnosed adult pulmonary TB population. A total of 1417 patients were enrolled, with 312 (22.02%) having a history of diabetes mellitus (DM). In comparison to non-diabetic TB (TB-NDM) patients, those with both TB and DM (TB-DM) had higher rates of fatigue, weight loss, and mild anemia (58.3% vs. 47.5%, $p = .001$; 8.21 ± 6.2 kg vs. 5.74 ± 4.0 kg, $p < .001$; 88.9% vs. 77.6%, $p = .021$). TB-DM patients also had a higher proportion with a TB severity score of ≥ 3 , though drug susceptibility testing (DST) results were similar between TB-DM and TB-NDM patients. Notably, the presence of central shadow in the pulmonary lobe and cavities was more frequent in the TB-DM group. Multivariable logistic regression identified high uric acid levels as an independent risk factor for thick-walled cavities in TB-DM patients (OR 2.81, 95% CI 1.24-6.40), with haemoptysis (OR 2.43, 95% CI 1.10-5.38) and chest pain (OR 5.22, 95% CI 1.38-19.70) also significantly associated with thick-walled cavities. The clinical features of TB-DM patients, particularly the presence of cavities on CT scans, were not linked to DST results. These findings aid in recognizing confounding variables and may influence treatment strategies and outcomes for TB-DM patients (15).

In conclusion, understanding the diverse clinical manifestations and diagnostic strategies of pulmonary tuberculosis is vital for early detection, effective treatment, and prevention of transmission, thereby mitigating its impact on individual health and public health systems worldwide.

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