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ORIGINAL ARTICLE

Clinical Spectrum and Laboratory Findings of Pulmonary Tuberculosis in Children

ASMA MUSHTAQ, SAMIA NAZ, SAIRA REHMAN

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Correspondence to:

Samia Naz,
Department of Pediatric Medicine, The Children's Hospital & the Institute of Child Health, Lahore

E-mail: naz_arfi@hotmail.com

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ABSTRACT

Objective: To determine the clinical presentations, laboratory and radiological findings and outcome of children with pulmonary tuberculosis.

Study Design: Descriptive study.

Place and Duration of Study: It was conducted at the department of Pediatric Medicine, The Children's Hospital & the Institute of Child Health, Lahore from January 2018 to June 2018.

Material and Methods: All patients of both genders of less than 15 years of age, with pulmonary tuberculosis as per Modified Kenneth Jones criteria, were enrolled in the study. Their demographic data, clinical presentations, examination findings, diagnostic tests, radiological findings, treatment and outcome were noted and recorded on pre-designed proforma. Data was analyzed by SPSS version 16.

Results: Fifty patients (26 males) of mean age 7.7(±3.8 SD) years were diagnosed as pulmonary tuberculosis. Cough was present in 43 (86%), fever in 41 (82%), respiratory distress in 34 (68%) and weight loss in 34 (68%) patients. History of contact with a tuberculous patient in 78% of patients. Half of the patients were vaccinated against tuberculosis with a definite BCG scar. ESR was raised in 47 (94%) patients and tuberculin skin test was positive in 26 (52%) cases. Miliary nodules were found in 17 (34%) patients and primary complex in 9 (18%) patients. All patients took anti-tuberculous treatment, 42 (84%) patients discharged and 8 (16%) patients expired.

Conclusion: Pulmonary tuberculosis has variable clinical presentations such as cough, fever, respiratory distress and lymphadenopathy along with raised ESR and military mottling. About two-thirds of patients were having contact with an already diagnosed case of tuberculosis.

Key words: *Tuberculosis, Pulmonary, Lymphadenopathy, TB*

INTRODUCTION

Tuberculosis (TB) is one of the infections disease throughout the world. It is one of the lethal infection causing 2 million deaths every year.[1] In developing countries tuberculosis is a serious problem. The global burden of pediatric tuberculosis has been under appreciated. In adults, there are many programs based on case detection and sputum smear results.[2] However,

many studies suggest that in developing countries, where disease is more prevalent, tuberculosis in children constitutes the main burden of disease, contributing about 15-20% of all cases.[3] Asia constitutes 55% followed by Africa with 31% of global disease burden.[4] Global threat due to tuberculosis, the Millennium Development Goals (MDGs) include decreasing the prevalence of TB by 50% by the end of 2015.[5,6] Among countries with high TB burden Pakistan ranks sixth. In Pakistan incidence of TB is 231 and prevalence is 420,000 per 100,000 populations.[7]

Clinical presentations of pulmonary TB in childhood are variable. There are two types of symptoms for diagnosis of pulmonary TB. 1- Constitutional symptoms due to the release of tuberculous toxins. 2- Local symptoms due to presence of disease in the respiratory tract. There is no single symptom that is sufficient to point towards the diagnosis of pulmonary tuberculosis. In children, tuberculosis is a fatal and serious disease with variable manifestations while in adults it is mostly post primary TB. In children, the extent of disease is a reflection of infectious adult smear positive cases in the population. Thus, it is said that tuberculosis in adults is the fountainhead of tuberculosis in children.[8]

It is difficult to diagnose TB in children because sampling for bacteriological confirmation is difficult to be done and confirmed.[9,10] Chest radiography is a valuable tool for diagnosis, but sometimes identification of hilar lymphadenopathy is difficult, which is the most significant finding of primary pulmonary tuberculosis.[11] Moreover, the differentiation between primary tuberculous infection and active tuberculous disease is difficult to diagnose only by radiography.[12] Though TB is common in our society yet no data available from our setup, so this study is planned. This study is conducted to determine the clinical presentations, laboratory and radiological findings and outcome of children with pulmonary tuberculosis.

MATERIALS AND METHODS

It was a descriptive study, conducted in the Department of Pediatric Medicine and Radiology Department at The Children's Hospital & the Institute of Child Health, Lahore from January 2018 to June 2018. All children of either gender and age less than 15 years who presented to outpatient clinic (OPD) or admitted with respiratory symptoms and signs (cough, fever, tachypnea) were included and after investigations (CXR, Mantoux test, sputum culture for TB, lymph node biopsy), all data were put in Modified Kenneth Jones criteria.[13] Patients who were having score 7 or more were labelled as TB and were enrolled in this study (table 1).

A specially designed proforma was filled in for each patient. Assessment of patients was done by a detailed history and clinical examination including H/O BCG vaccination with positive BCG scar, history of TB exposure and nutritional status of the patients assessed by weight and height plotted on Z-score system by WHO.[14] Investigations including complete blood count, ESR, tuberculin skin test, lymph node biopsy, chest radiography, ultrasonography (USG), and pleural tap where required were done. Tuberculin skin test was interpreted at 48-72 hours following intradermal injection of 5 tuberculin units of purified protein derivative, and was considered positive when the local induration was more than 10 mm.

Chest radiographs were interpreted by a Pediatric Radiologist with regards to lymphadenopathy, parenchymal and pleural lesions. Sputum, gastric aspirate and pleural fluid were sent for Mycobacterium tuberculosis (MTB) isolation. Two sputum specimens were collected only from all children aged 5years and above if they could produce sputum, for direct sputum smear examination by ZN technique and culture & sensitivity examination. Children below the age of 5 years were not subjected to sputum examination and their early morning gastric aspirates were sent for examination of acid fast bacilli. All patients were prescribed anti-tuberculosis therapy and followed up in the ward till discharge and then in outpatient clinic after one month of discharge for clinical response to therapy which include resolution of fever, radiological response and culture negative in those patients who were positive at presentation.

TABLE 1: Modified Kenneth Jones criteria for diagnosis of Tuberculosis in children

	1	2	3	4	5
History					
Age	<2 years				
Contact	With sputum –ve TB patient		With sputum +ve TB patient		
BCG scar	Absent				
History of measles and whooping cough	Within 3-6 months	Within 3 months			
Immunocompromised/ immunosuppresant	Yes				
PCM 3	Yes		Not improving		
Examination and investigations					
Physical examination		*suggestive		**Strongly suggestive	_
Radiological findings	***Non specific	****Strongly suggestive	_	_	_
Tuberculin test/ BCG	5-10 mm	_	>10 mm	_	_
Granuloma					Specific TB
AFB					Positive

Interpretation:

0-2 points	TB unlikely
3-4 points	keep under observation
5-6 points	tuberculosis probable, investigations may justify therapy
7 or more points	TB unquestionable

If * pneumonia / consolidation not responding to antibiotic therapy
If ** tuberculous pleural effusion, gibbus
If *** ill-defined opacity, marked broncho-vascular marking
If **** paratracheal / mediastinal adenitis, miliary mottling

RESULTS

Total 50 patients who fulfilled the inclusion criteria were enrolled in this study. Out of these, 26 patients (52%) were male and 24 patients (48%) were female. Most common age group was 5-10 years which includes 19 (38%) patients, followed by 16 (32%) patients between 10-15 years, 9 (18%) patients were between 2-5 years and 6 (12%) were less than 1 year of age. Mean age was 7.7 (±3.8 SD) years with age range of 4 months to 14 years.

The most common presenting complaint was cough followed by fever, respiratory distress, weight loss and chest pain (fig 1). On examination 45 (90%) patients were febrile, 42 (84%) patients were in respiratory distress and lymphadenopathy was found in 21 (42%) patients. In 11 patients, it was cervical lymphadenopathy and in 10 patients it was generalized lymphadenopathy. Chest examination revealed bilateral crepitation in 33 (66%) patients, unilateral crepitation in 17 (34%) patients and decreased breath sounds with dull percussion note due to pleural effusion in 11 (22%) patients.

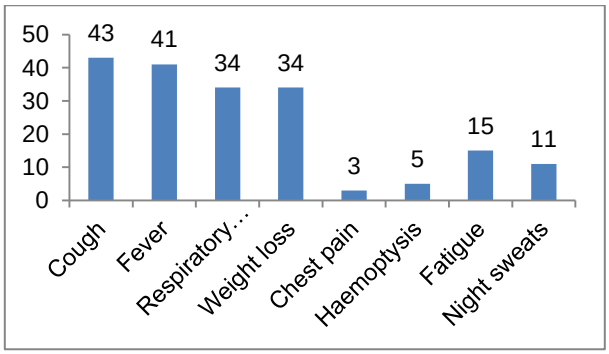

Fig 1: Presenting symptoms in patients with pulmonary tuberculosis (n= 50)

The history of exposure to TB was found in 39 (78%) patients, the index cases were father in 15 (30%) patients, grandfather in 9 (18%), mother in 5 (10%), grandmother in 4 (8%), other sibling in 4 (8%) and neighbor in 2 (4%) patients.

Twenty-five (50%) patients were vaccinated with Bacillus Calmette Guerin (BCG). According to Z-score system of undernutrition assessment, all children were undernourished, out of which 27 (54%) were severely malnourished.

Investigations showed raised ESR in 47 (94%) patients. Tuberculin skin test was positive in 26 (52%) patients and was negative in 24 (48%) patients. Lymph node biopsy was done in 7 (14%) patients who demonstrate granulomatous changes and caseous necrosis, consistent with tuberculosis. Pleural tap was done in 9 (18%) patients, giving exudative picture with predominant lymphocytes and proteins >2.5 gm/dl in all cases.

Mycobacterium tuberculosis (MTB) isolation from sputum was found positive only in 6 (12%) patients while we were unable to isolate any mycobacterium from gastric aspirate or pleural fluid.

All children had chest radiographs and 34% (n=17) had miliary nodules followed by consolidation with hilar adenopathy (primary complex) in 9 (18%) cases (table 2).

TABLE 2: Radiographic findings in patients with pulmonary tuberculosis (n= 50)

Radiographic findings	Number	Percentage
Miliary shadows	17	34.0
Primary complex	9	18.0
Lobar collapse/ consolidation	5	10.0
Consolidation+ cavitation	2	4.0
Consolidation+ effusion	6	12.0
Hilar+ mediastinal LN	6	12.0
Consolidation+ LN+ effusion	5	10.0

Anti-tuberculous treatment was given to all patients. It consisted of isoniazid, rifampicin, pyrazinamide and streptomycin/ethambutol for 2 months and isoniazid and rifampicin for a period of 9 months. Response to first line ATT was seen in 39 (78%) patients while 11 (22%) patients did not respond and were shifted to second line ATT. Multi-drug resistant tuberculosis was found on culture in 4 patients while in 7 patients it was diagnosed on clinical grounds and report of gene expert. Out of our 50 patients, 42 (84%) took therapy without any complications and were discharged. During stay in hospital eight patients expired and cause of death was respiratory failure in 5 patients while 2 patients developed complication of tuberculous meningitis and one developed tuberculous pericarditis and expired.

DISCUSSION

Tuberculosis is one of the leading causes of morbidity and mortality in developing countries. There are many factors that may cause the recent resurgence of tuberculosis, such as poverty, homelessness, immigration, the Acquired Immunodeficiency Syndrome (AIDS) epidemic, inadequate tuberculosis control programs and the emergence of multiple drug resistant strains of tubercle bacilli.[1,2]

In our study, there was slight male dominance constituting 52% of the cases. These findings were almost similar to another study with 50% involvement of males.[15] The slight increase number of male in our study may be due to the gender discrimination in South East Asia, bringing male children to tertiary care center. The commonest clinical presentation in our study was cough, fever, respiratory distress and weight loss, consistent with Marais J,[15] who mentioned that tuberculosis was not associated with a single symptom rather than had a combination of various symptoms. In children, most common symptom is weight loss alone or along with other symptoms. However other studies have described that about half of patients have no significant symptoms at the time of first presentation.[16] In majority of our patients, there was history of contact with a tuberculous patient indicating the importance of isolation of such patients especially in prevention of children from exposure to them. However, another study describes the history of contact in 23% in less than 1 year, 65% in 1-5 years and 12.5% above 5 years of age.[17] Childhood tuberculosis has diagnostic challenges because children either have no symptom or having non-specific symptoms at the time of presentation and there is not one reliable and cheap test available for diagnosis. Moreover, it is extremely difficult to collect sputum sample in children, complications in interpretation of tuberculin skin test & chest

radiographs. Culture yield varies with the severity of illness, specimen type and culture method. Induced sputum is recognized as a safe procedure with a high diagnostic yield.[18] In our study tubercle bacilli were isolated from sputum in a small number of patients while yield from gastric aspirate and pleural fluid was zero.

On chest radiography, miliary nodules were the most common finding followed by primary complex in our study. However, Shrestha S et al[19] describes that the most common findings on chest radiograph is consolidation followed by pleural effusion and hilar lymphadenopathy. The combination of nodal involvement and parenchymal lung involvement is known as Ghon's complex caused by tuberculosis. In children, Ghon's complex is common and also have viable bacteria which can reactivate later in life. Even minor blunting of costophrenic angles in children due to pleural effusion must be considered a finding that can suggest active tuberculosis. Consolidation, a cavitary lesion, nodule with ill-defined margins or miliary nodules all suggest active tuberculosis. In childhood TB radiological findings may overlap in various diseases. Expertise in interpretation of radiological findings of pulmonary tuberculosis is key to diagnostic accuracy.

There was good initial response to first line anti tuberculous therapy in most of our patients. Multi drug resistant tuberculosis was present in 11 of our patients, which is a significant number indicating the importance of adequate treatment and good compliance to therapy.

CONCLUSION

Pulmonary tuberculosis has variable clinical, laboratory and radiological presentations including cough, fever, respiratory distress, lymphadenopathy, raised ESR and military mottling. Two-third of patients were having a contact with tuberculous patient. Hence, a suggestive history and modified KJ criteria along with contact tracing and tuberculin skin test are integral components in early diagnosis of pulmonary tuberculosis in children. Early treatment in children with pulmonary TB can improve the outcome and risk of complications.

Authors' affiliation

Asma Mushtaq, Samia Naz, Saira Rehman
Department of Pediatric Medicine, The Children's Hospital & the Institute of Child Health, Lahore

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