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Assessment of clinical profile of children diagnosed with pulmonary tuberculosis from NMCH Patna

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Abstract
Researchers often use individually designed criteria for enrolment, diagnostic classifications, and reference standards, thereby hindering the interpretation and comparability of their findings. Reliable data on the clinical profile of all forms of TB amongst children in India are not available. Most surveys conducted have focused on pulmonary TB and no significant studies on extra pulmonary TB specially on childhood tuberculosis are available. Hence the present study was planned to assess the clinical profile of the pulmonary tuberculosis in the paediatric patients
The 50 childrens diagnosed with the pulmonary tuberculosis in the NMCH Patna from Jun 2018 to Dec 2018 were evaluated in the present study. A detailed clinical history, family history of contact with TB disease, and physical examination for each child was recorded in a standardized format. All patients undergoes the chest X-ray for the knowing the radiographic findings.
In conclusion, childhood tuberculosis is common in our setting with the pulmonary TB being the most common one. The diagnosis of tuberculosis is very difficult in children. There is no gold standard test for the diagnosis of childhood TB. Most of the cases were diagnosed on the basis of epidemiological and clinical suspicion supported by various investigation results. Thus further research into the epidemiology, immune mechanisms, diagnosis, treatment and prevention of childhood tuberculosis is urgently needed. Advances in our understanding of tuberculosis in children would provide insights and opportunities to enhance efforts to control this disease.

Keywords: pulmonary tuberculosis, children's, Bihar region

Introduction
Pulmonary tuberculosis is defined as an active infection of the lungs. It is the most important TB infection, because an infection of the lungs is highly contagious due to the mode of droplet transmission. It can be life-threatingly dangerous to the patient: if left untreated, more than 50% of patients with pulmonary tuberculosis die. Worldwide, 87% of all tuberculosis cases that were reported in 2004 were either only pulmonary TB or included pulmonary TB.
Tuberculosis may infect any part of the body, but most commonly occurs in the lungs (known as pulmonary tuberculosis) [9]. Extra pulmonary TB occurs when tuberculosis develops outside of the lungs, although extra pulmonary TB may coexist with pulmonary TB. General signs and symptoms include fever, chills, night sweats, loss of appetite, weight loss, and fatigue. Significant nail clubbing may also occur.
If a tuberculosis infection does become active, it most commonly involves the lungs (in about 90% of cases). Symptoms may include chest pain and a prolonged cough producing sputum. About 25% of people may not have any symptoms (i.e. they remain "asymptomatic"). Occasionally, people may cough up blood in small amounts, and in very rare cases, the infection may erode into the pulmonary artery or a Rasmussen's aneurysm, resulting in massive bleeding. Tuberculosis may become a chronic illness and cause extensive scarring in the upper lobes of the lungs. The upper lung lobes are more frequently affected by tuberculosis than the lower ones. The reason for this difference is not clear. It may be due to either better air flow, or poor lymph drainage within the upper lungs [1].
Most cases of pulmonary TB are post-primary TB infections. This means that after the initial, primary infection has healed, the granuloma (the mass of immune cells surrounding the TB infection preventing it from doing further damage) that was formed during that process still contains TB bacteria, which can survive for years.
If the immune system of the person with a TB granuloma deteriorates, these bacteria can be reactivated and TB may break out again. Once the TB bacilli become reactivated, they rapidly destroy the lung tissue around the granuloma. This causes major damage to the tissue, which gets destroyed. Lung tissue is usually very thin and almost sponge-like because it is filled with air in the alveoli, where oxygen is exchanged from the air into the blood. The lung tissue affected by TB bacilli first becomes hard, making the oxygen exchange impossible. This is called fibrosis.
As a second step, the cells that make up the lung tissue die. This is called necrosis. Dead, or necrotic, tissue tends to tear and break down. In the lung, this is called 'cavitation', after the latin word for cave. It is thought that the TB bacilli destroy the lung tissue in a cave formation, where more and more of them

sit in the middle and slowly destroy more tissue at the edges. These cavitations can be seen on X-rays to diagnose pulmonary TB (see picture). A cavitation contains sputum with about 1 million TB bacilli per millilitre. The danger of cavitations, besides the destruction of the healthy lung tissue, is that through progressive destruction they eventually reach a part of an airway. If that happens, the TB bacilli destroy the wall of the airway and thus have a connection to the outside. Through the airway, they can be transported up into the trachea, through the mouth and nose of a coughing person, and be transmitted to other people through droplet infection.

People with pulmonary TB cough a lot, because the destruction of tissue in the lungs and airways leads to inflammation. The body reacts to inflammation by trying to eliminate the particle that caused it – if this happens in the airway, the easiest way to eliminate the cause is to cough it up. Initially, people with pulmonary TB have a dry, persistent cough. This cough is often worse at night. This symptom shows in about 85% of people with pulmonary TB. Often the cough is accompanied by fever, also worse at night, and in combination with excessive sweating. People with pulmonary tuberculosis lose weight, because the body uses a big part of its energy to fight the infection in the lungs – and this means that energy cannot be stored in the body to gain weight and stay healthy. As the destruction of lung tissue becomes worse, the sputum that people with pulmonary TB cough up starts to have blood stains in it – a sign of the tissue destruction and inflammation in the airway.

From the first cavitation in the lung tissue, the TB bacilli can spread through the destructed tissue. If they have reached an airway, they will spread to other parts of the lung, travelling up and down the airway and finding new places to settle and form a new cavitation. This is called bronchogenic spread (bronchus = the airway, -genic = coming from). If they gain access to a blood vessel (blood vessels are spread out throughout the lung tissue to provide oxygen and other nutrients transported in the blood), they can travel in the bloodstream and be disseminated all over the lungs and into other parts of the body. The result of this dissemination is called 'disseminated TB' or 'miliary TB', and it usually happens when the body's immune system is not able to contain the infection, for example when it is weakened by HIV [2].

Researchers often use individually designed criteria for enrolment, diagnostic classifications, and reference standards, thereby hindering the interpretation and comparability of their findings. Reliable data on the clinical profile of all forms of TB amongst children in India are not available. Most surveys conducted have focused on pulmonary TB and no significant studies on extra pulmonary TB specially on childhood tuberculosis are available. Hence the present study was planned to assess the clinical profile of the pulmonary tuberculosis in the paediatric patients.

Methodology

The 50 childrens diagnosed with the pulmonary tuberculosis in the NMCH Patna from Jun 2018 to Dec 2018 were evaluated in the present study. A detailed clinical history, family history of contact with TB disease, and physical examination for each child was recorded in a standardized format. All patients undergoes the chest X-ray for the knowing the radiographic findings.

Radiologically, patients with parenchymal opacities along with lymph node involvement were labeled as primary complex. Patients in which there was local progression of parenchymal disease with development of cavitation or atelectasis were labeled as primary progressive. Those with involvement of the tracheobronchial tree were labeled as Endobronchial TB. Patients with cavitatory lesions were labeled as cavitatory Pulmonary TB. Patients with innumerable, small, non-calcified nodules scattered throughout the lungs on radiological examination were labeled as Miliary TB [3]. Patients with isolated pleural involvement without involvement of lung parenchyma or those with isolated mediastinal adenopathy and those with normal chest X-ray but positive tuberculin skin test (TST) were excluded from the study.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: All children (male and female) with tuberculosis; Diagnosed positive at hospital; Children below 15 yrs old.

Exclusion Criteria: Childrens with whose parents are not willing to give consent for the study; Patient with MDR-TB and XDR-TB; Congenital tuberculosis.

Results & Discussion

Tuberculosis is a major health problem worldwide posing a challenge to the health system since ancient time. Paediatric tuberculosis has traditionally received a lower priority than adult TB in National TB programmes because of its considered non-infectious, is difficult to diagnose, cases have been thought to be few and it was wrongly assumed that effective control of adult TB and use of BCG by itself could prevent childhood TB [4]. Childhood TB can be considered as "the neglected rising Epidemic" despite the decrease in TB burden since 1960s resurgence was seen in nineties due to resistant (MDR, XDR and recently TDR) and HIV infection [5]. The extent of childhood TB in India is unknown due to diagnostic difficulties; it is estimated to be 10.2% of the total adult incidence [6]. The maximum risk of a child getting TB is between 1-4 years when there is an increased risk of progression from infection to disease.

As per the global review of Tuberculosis by World Health Organization, India comes under a group of high prevalence countries with an annual risk between 1 and 2.5%. India accounts for 26% of total global cases [7]. The Diagnosis of tuberculosis in children is very difficult. Children under 10 years old with pulmonary tuberculosis rarely cough up sputum because they swallow their sputum, which means bacteriological confirmation is usually not possible [8]. Diagnosis of TB in children usually follows discovery of a case in an adult, and relies on tuberculin skin testing, chest radiograph, and clinical signs and symptoms. However, clinical symptoms are nonspecific, skin testing and chest

radiographs can be difficult to interpret, and routine laboratory tests are not helpful. Although more rapid and sensitive laboratory testing, in molecular biology, immunology, and chromatography, is being developed, the results for children have been disappointing [9]. Nucleic Acid amplification technique offer rapid results [10]. Serology and polymerase chain reaction (PCR) based diagnostic method have failed to help a clinician working at the peripheral level [11].

Table 1: Clinical Profile of the childrens

Parameters		No. of Cases
Gender	Males	29
	Females	21
Socioeconomic Class	Low	26
	Middle	16
	High	8
	Total Cases	50
Fever		41
Cough		34
Loss of appetite		21
Respiratory distress		2
Chest pain		2
Hemoglobin (g/dl)		9.1 – 12.2
Platelet count (10^5 /cumm)		2.2 – 5.2
ESR (mm at end of I hour)		22.4 – 48.6
White cell count (10^3/cumm)		8.3 – 16.5
Lymphocyte		35.6 – 58.1
TST positive (%) (values not known in 7 patients)		13.5 – 24.6

Table 2: Chest radiograph findings

Findings	No. of Cases
Consolidation	12
Nonspecific finding	9
Pleural effusion	7
Hilar lymphadenopathy	6
Hazy densities	5
Pericardial effusion	4
Milliary mottling	3
Cavitation	3
Atelectasis	1
Total	50

Tuberculosis is found to be more common among patients of rural areas and lower socio-economic status, where malnutrition, over-crowding and poor access to medical facilities is common, and in conditions that weaken the immune system such as malnutrition, human immunodeficiency virus coinfection, diabetes mellitus, and prolonged use of steroids. Like TB, some skin conditions like pityriasis versicolor, scabies, borderline lepramatous leprosy, non-specific pruritus are disorders related to weak immunity. Similar risk factors also increase susceptibility to skin conditions [12].

Diagnosis of tuberculosis is difficult in children and haematological parameters usually aid in the diagnosis. Raised ESR was seen in most types of TB in our patients, which is similar to a study done by Aziz *et al*. who found a high ESR in most patients with pulmonary Tuberculosis [13]. However, on statistical analysis, it was found out that anemia was most commonly seen in patients of pulmonary TB with cavitatory lesions. Other studies have showed anemia in 16-94% in patients with pulmonary TB. Anemia in TB develops due to suppression of erythropoietin production due to tumor necrosis factor a and other cytokines released by activated monocytes [14-15].

Chest X-ray is routinely done to aid the diagnosis of TB in children. The most common chest X-ray findings in our patients were primary complex, primary progressive and cavitatory type. This is similar to the findings in other study done by Krysl *et al*, where primary complex in 70% of the children, followed by cavitation in 10-30% and pleural effusion in 5-10% of the pediatric cases [16].

With the current demographic transition and increasing life expectancy in low- and middle-income countries, the proportion of young person's is increasing, and the incidence of TB among them is expected to increase. Thus, failure of early identification and management of TB in the youth can present major challenges for a TB control programme–perpetuating the chain of transmission in the community [17].

This study has observed that TB still continues to be a major problem in younger age group who are undernourished and belonging to low socio-economic status. Poor housing conditions which continue to haunt our population is an important risk factor for TB transmission. Thus improving the socio-economic conditions and proper treatment of adult TB who are the major source of infection to youth will go a long way in preventing it.

The current study had certain limitations. First, the number of patients enrolled was relatively small. Secondly, no distinction was made between out-patients and in-patients since the authors had felt that it would have been difficult to bring out any meaningful conclusions for out patients and in-patients separately in view of the small numbers involved.

Conclusion

In conclusion, childhood tuberculosis is common in our setting with the pulmonary TB being the most common one. The diagnosis of tuberculosis is very difficult in children. There is no gold standard test for the diagnosis of childhood TB. Most of the cases were diagnosed on the basis of epidemiological and clinical suspicion supported by various investigation results. Thus further research into the epidemiology, immune mechanisms, diagnosis, treatment and prevention of childhood tuberculosis is urgently needed. Advances in our understanding of tuberculosis in children would provide insights and opportunities to enhance efforts to control this disease.

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