

ORIGINAL ARTICLE

FREQUENCY OF PEDIATRIC (LESS THAN 15 YEARS) PULMONARY TB CASES IN ALLAMA IQBAL MEMORIAL TEACHING HOSPITAL AND BETHANIA HOSPITAL, SIALKOT IN LAST THREE MONTHS.

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<p>Affiliations</p> <p>1. Associate Professor/ HOD, Paediatric Department, Khawaja M. Safdar Medical College, Sialkot. drmudassar74@hotmail.com</p> <p>2. Assistant Professor of Pathology, Khawaja M. Safdar Medical College, Sialkot. shahxaibch@gmail.com</p> <p>3. Paediatrician, Head of Paediatrics Department, Zohra Memorial Hospital, Sialkot drjavedasghar@gmail.com</p> <p>4. Head of Paediatric Department, Memorial Christian Hospital, Sialkot. gamarjohn1965@gmail.com</p> <p>5. 4th Year MBBS Student Azerbaijan Medical College, Baku Azerbaijan. ammarsadiqghumman@gmail.com</p> <p>6. 1st Year MBBS Student Azerbaijan Medical College, Baku Azerbaijan. daniajahangir@gmail.com</p> <p>7-11 4th year MBBS students eshazubair4thyear2023@smcs.com.pk ovaissalif4thyear2023@smcs.com.pk amnarijaz4thyear2023@smcs.com.pk esatahir4thyear2023@smcs.com.pk ahamdjameel4thyear2023@smcs.com.pk</p> <p>Corresponding Author: Dr. Mudassar Hussain, Associate Professor of Paeds/ HOD, Khawaja M. Safdar Medical College, Sialkot Contact # 0301-6193088 Email: drmudassar74@hotmail.com</p>	<p>Abstract:</p> <p>Objectives: To evaluate the clinical and bacteriological cases of Pulmonary Tuberculosis (PTB) in children less than 15 years of age presented in 3 months to determine the ratio of children predictive of confirmed PTB.</p> <p>Methods: This was a retrospective study of children (less than 15 years of age) presented to the Allama Iqbal Memorial Teaching Hospital (AIMTH) and Bethania Hospital, Sialkot with presumptive diagnosis of PTB. Clinical, bacteriological, and laboratory findings were studied, those with positive Mycobacterium tuberculosis (MTB) cultures, those likely to have PTB based on clinical criteria but with negative cultures, and those who did not meet clinical diagnostic criteria or have positive cultures.</p> <p>Results: A total of 496 cases of Tuberculosis were observed in Bethania Hospital out of which 393 were of Pulmonary TB and 103 cases were of Extra Pulmonary TB. 175 patients were diagnosed at Bethania Hospital with definitive PTB bacteriological confirmed out of which 3 were children below 15 years of age with 2 girls and 1 boy (1.7%) Another 218 patients were clinically confirmed at Bethania Hospital with PTB based on meeting at least 2 of the following criteria: cough lasting for at least 2 weeks, typical chest radiograph changes, purified protein derivative (PPD) ≥ 10 mm, or history of tuberculosis family contact. Out of these 218 patients, 26 were children below 15 years of age with 13 girls and 15 boys (11.9%). A total of 294 cases of Tuberculosis were observed in AIMTH out of which 109 were of Pulmonary TB and 185 were of Extra Pulmonary TB. 109 patients were clinically diagnosed with PTB at AIMTH out of which 14 were children under 15 years with 6 boys and 8 girls (13.7%). Patients with PTB diagnosed clinically were significantly more likely than those diagnosed bacteriologically. A total of 502 cases were confirmed for PTB in both hospitals out of which 44 (8.76%) children were below 15 years of age.</p> <p>Conclusion: Out of total 502 patients only 44 were children under the age of 15 years. It is concluded that children under 15 years were significantly at a lower risk of developing this disease.</p> <p>Keywords: AFB Smear, Pulmonary Tuberculosis, Positive Cultures, Presumptive Diagnosis, Bacteriologic and Clinical diagnosis.</p> <p>Cite this Article as: Hussain M., Ghazanfar S., Asghar M.J., John Q.S., Zubair E., Saif O., et al.; Frequency of Pediatric (Less than 15 Years) Pulmonary TB Cases in Allama Iqbal Memorial Teaching Hospital and Bethania Hospital, Sialkot in Last Three Months. <i>SIAL J Med. Sci.</i> 2023 V-2 (Issue-06):35-42</p>
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Introduction

Global and national health actors spent the first decade of the 21st century ignoring children affected by tuberculosis (TB)—

children were not viewed as driving the TB epidemic so were not prioritized in the global TB response. The World Health Organization (WHO) only started reporting pediatric-specific (<15 years) TB disease

estimates in 2012. We now know that children represent 12 percent of the global TB burden (1.2 million of 10 million) and 16% of TB deaths (230,000 of 1.5 million in 2020) each year.

Active (tuberculosis) case-finding:

Provider-initiated screening and testing in communities by mobile teams, often using mobile Xray and rapid molecular tests. The term is sometimes used synonymously with “systematic screening”

Age groups:

- Infant: aged under 1 year (12 months)
- Pre-School less than 5 years
- School going greater than 5 years
- Adolescent: aged 10–17 years

Contact investigation:

Systematic identification of people, including children and adolescents, with previously undiagnosed TB disease and TB infection among the contacts of an index TB patient in the household and in comparable settings in which transmission occurs. It consists of identification, clinical evaluation and/or testing and provision of appropriate TB treatment (for people with confirmed TB) or TB preventive treatment (for people without TB disease).

Extensively drug-resistant tuberculosis (XDR-TB):

Pre-XDR-TB: TB caused by *Mycobacterium tuberculosis* strains that fulfil the definition of multi drug resistant TB (MDR-TB) or rifampicin-resistant TB (RR-TB) and that are also resistant to any fluoroquinolone.

XDR-TB: TB caused by *M. tuberculosis* strains that fulfil the definition of MDR/RR-TB and that are also resistant to any fluoroquinolone and at least one additional Group-A medicine.

Multidrug-resistant tuberculosis (MDR-TB): TB caused by *Mycobacterium tuberculosis* strains that are resistant to at least both rifampicin and isoniazid.

Pulmonary tuberculosis (PTB) (classification):

Any bacteriologically confirmed or clinically diagnosed case of TB involving the lung parenchyma or the tracheobronchial tree, including tuberculous intrathoracic lymphadenopathy (mediastinal and/or hilar), without radiographic abnormalities in the lungs.⁹ Miliary TB is classified as PTB with multiple lesions in the lungs. A person with both PTB and extrapulmonary TB should be classified as having TB.²

Rifampicin-resistant tuberculosis (RR-TB): TB caused by *Mycobacterium tuberculosis* strains resistant to rifampicin. These strains may be susceptible or resistant to isoniazid (i.e. MDR-TB) or resistant to other first-line or second-line TB medicines. In these guidelines and elsewhere, MDR-TB and RR-TB cases are often grouped as MDR/RR-TB and are eligible for treatment with an MDR-TB regimen

Severe pneumonia: Cough or difficulty in breathing plus at least one of the following:

- Central cyanosis or oxygen saturation <90% on pulse oximetry
- severe respiratory distress (e.g. grunting, nasal flaring, very severe chest (indrawing)
- signs of pneumonia with a general danger sign (inability to breastfeed or drink, persistent vomiting, lethargy or unconscious, convulsions, stridor in a calm child, severe malnutrition).³

Systematic screening for tuberculosis disease: Systematic identification of people at risk for TB disease in a predetermined target group by assessing symptoms and using tests, examinations or other procedures that can be applied rapidly. For those who are screen positive, the diagnosis needs to be established by one or several diagnostic tests and additional clinical assessments. This term is sometimes used interchangeably with “active tuberculosis case-finding”. It should be distinguished from testing for TB infection (with a TB skin test or interferon-gamma release assay).⁴

Pediatric tuberculosis (TB): It refers to the occurrence of tuberculosis in children, typically below the age of 15. Tuberculosis is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. While in majority cases, TB primarily affects the lungs, it can also affect other organs in the body. The clinical presentation and management of pediatric TB can differ from that of adult TB, warranting specific attention to this age group.

Epidemiology: Pediatric TB is a significant global health concern, especially in areas with a high burden of TB. Children are more susceptible to TB infection and have a higher risk of progressing from latent infection to active disease compared to adults. According to the World Health Organization (WHO), an estimated 1 million children fell ill with TB in 2020, and around 205,000 children died from the disease.

Transmission: TB is primarily transmitted through the inhalation of airborne droplets containing the *Mycobacterium tuberculosis* bacterium. Children usually acquire TB from close contact with an infectious adult or another infected child. Transmission can occur within households, communities, or institutional settings like schools and childcare centers.¹

Clinical Presentation: Pediatric TB can present with a wide range of symptoms, and diagnosis can be challenging due to nonspecific signs. Infants and young children may not show typical symptoms like cough or sputum production. Common symptoms of pediatric TB include¹:

1. Prolonged or recurrent fever
2. Poor weight gain or failure to thrive
3. Cough, sometimes with phlegm or blood
4. Night sweats
5. Fatigue or malaise
6. Decreased appetite

Diagnosis: Diagnosing TB in children can be more complex than in adults. Children often have paucibacillary (fewer bacteria)

disease, which can result in negative sputum smear tests. The diagnosis of pediatric TB typically involves multiple steps, including a thorough history, physical examination, tuberculin skin test (TST) or interferon-gamma release assays (IGRAs), chest X-ray, and microbiological testing (e.g., culture and molecular tests)¹.

Treatment: The treatment of pediatric TB follows the same principles as adult TB, which involves a combination of multiple anti-tuberculosis drugs. The choice of drugs and duration of treatment depend on the child's age, weight, drug susceptibility testing results, and the presence of any other comorbidities. Commonly used drugs include isoniazid, rifampicin, pyrazinamide, and ethambutol. Directly observed therapy (DOT) is often recommended to ensure treatment adherence¹.

Prevention: Younger children are at an increased risk of progressing from TB infection to active disease and of developing severe forms of TB (e.g., meningitis and miliary or other forms of disseminated disease). This increased risk underscores the importance of TB prevention measures, including contact investigations, TB preventive treatment (TPT), and TB vaccines for children and young, malnourished, and immune-compromised children in particular.

Tuberculosis in Pakistan: Tuberculosis (TB) continues its ravages against humankind despite the fact that its causative organism *Mycobacterium tuberculosis* was identified way back in 1882 and cost-effective drugs to treat the vast majority of people have been available since more than half a century, although more effective and newer therapeutic agents continue to be introduced. In 2019, an estimated 10 million people developed TB worldwide, with an estimated 1.408 million (~ 3,900/day) TB deaths, making it the leading killer among infectious diseases and one of the top ten

causes of death worldwide.¹ Furthermore, people with TB have to cope with the social and economic impacts of the disease including falling further into poverty, stigma and discrimination. Meanwhile, drug resistant TB emerging due to gaps in TB detection and treatment complicates the TB responses. In 2019, around 500,000 people developed drug-resistant tuberculosis globally with almost half of them dying.¹

In 2018, the first United Nations General Assembly high-level meeting on TB, attended by several Heads of State / Government and Pakistan's Foreign Minister, concluded with an action-oriented political declaration, building on previous commitments to strengthen action and investments towards to end TB. The declaration highlighted the need for ending the epidemic in all countries and also to work in collaboration to accelerate the national and the global collective actions, financing and revolutions required to combat this preventable and treatable disease.² Pakistan has the fifth greatest burden of both drug sensitive and drug-resistant TB globally, with an incidence of 263/100,000 translating into 580,000 persons who develop TB annually, around 220,000 (38%) go 'missing' and are not notified in the national database.⁵

Among people with DR-TB, the proportion missed is far worse (75%). Not surprisingly, TB remains one of Pakistan's priority health problems limited access to TB services, rapid molecular diagnostic testing, preventative services and reaching vulnerable populations. There is a need for better collaboration between the public sector and private providers, while making efforts for overall health system strengthening.⁵

Although the TB program started with unique governmental commitment across the country in 2000-2001, it is now mostly donor driven, and despite treating hundreds

of thousands of people over the years, the impact on the disease incidence has been minimal mostly owing to the large proportion of 'missing' cases.⁵

All TB care services, including diagnosis, treatment, psycho-social support where necessary and follow-up are free in Pakistan including those for drug-resistant TB, entailing the high medical cost largely made possible mainly by generous grants from The Global Fund, with only a small proportion of the costs coming through domestic spending. An enormous challenge in Pakistan, which has a low literacy rate particularly in rural females, is the lack of adequate awareness concerning TB not just in communities but even in healthcare workers, which leads to the stigmatization of the disease that could be addressed through health education and enhanced TB related education among communities.⁵ There is a need for increasing TB awareness related to mode of transmission, prevention, diagnosis, treatment and reducing stigmatization of the disease through health education.¹

Objectives

To evaluate the clinical and bacteriological cases of Pulmonary Tuberculosis (PTB) in children less than 15 years of age presented in 3 months to determine the ratio of children predictive of confirmed PTB.

Methodology

Retrospective Audit: A retrospective study was done for investigating the number of cases of PTB in children below 15. Retrospective study uses existing data that have been recorded for reasons other than research. It investigates outcomes specified at the beginning of a study by looking backwards at data collected from previous patients. Patients are enrolled after the clinical event of interest or exposure has occurred: this is usually conducted by review of the medical notes. Consequently, researchers can complete their assessment

more quickly and inexpensively than prospective designs that must follow subjects over time and record the data under carefully controlled conditions.

Retrospective Study Designs of study: Retrospective studies use various designs. While these designs differ in detail, they all tend to compare subjects with and without a condition and determine how they differ. Using the usual hypothesis tests, researchers can determine whether there are statistically significant relationships between subject variables (risk factors, personal characteristics, etc.) and the outcome of interest.

Retrospective Cohort Study: This study design compares groups of subjects who are similar overall but differ in a particular characteristic, such as exposure to a risk factor. Because it is a retrospective study, the researchers find individuals where the outcomes are known when the project starts. Retrospective cohort studies frequently determine whether exposure to risk and protective factors affects an outcome.

Case-Control Studies: Case-control designs are generally retrospective studies. Like their cohort counterparts, case-control studies compare two groups of people, those with and without a condition. These designs both assess risk and protective factors.

Advantages of a Retrospective Study

Cheaper: You don't need a lab or equipment to measure information. Others did that for you

Faster: The events have already occurred in a retrospective study—no need to wait for them to happen and then look for the differences between the groups.

Great for rare diseases: You can specifically look through a database for individuals with a rare disease or condition. In a prospective experiment, you need an immense sample

size and hope enough of the rare outcomes occur for you to analyze.

Disadvantages of a Retrospective Study

A retrospective study uses data measured for other purposes. Different people, procedures, and equipment might have recorded the data, leading to inconsistencies. Measurements might have occurred under differing conditions. Control variables might not be measured, leading to confounding recall bias.

Results:

Our study was conducted in two different hospitals

- Bethania Hospital Sialkot
- Govt. AIMTH Sialkot

Cases in Bethania Hospital: A total of 496 cases of Tuberculosis were observed in Bethania Hospital out of which 393 were of Pulmonary TB and 103 cases were of Extra Pulmonary TB.

175 patients were diagnosed at Bethania Hospital with definitive PTB bacteriological confirmed out of which 3 were children below 15 years of age with 2 girls and 1 boy (1.7%) Another 218 patients were clinically confirmed at Bethania Hospital with PTB based on meeting at least 2 of the following criteria: cough lasting for at least 2 weeks, typical chest radiograph changes, purified protein derivative (PPD) ≥ 10 mm, or history of tuberculosis family contact. Out of these 218 patients, 26 were children below 15 years of age with 13 girls and 15 boys (11.9%)

Cases in AIMTH: A total of 294 cases of Tuberculosis were observed in AIMTH out of which 109 were of Pulmonary TB and 185 were of Extra Pulmonary TB. 109 patients were clinically diagnosed with PTB at AIMTH out of which 14 were children under 15 years with 6 boys and 8 girls (13.7%) Patients with PTB diagnosed clinically were significantly more likely than those diagnosed bacteriologically.

Findings:

A total of 502 cases were confirmed for PTB in both hospitals out of which 44 (8.76%) children were below 15 yrs of age.

Age Ranges:	No of Cases of PTB
0 – 6 months	0
7 months – 1 year	1
2 yrs – 4 yrs	3
5 yrs – 10 yrs	29
11 yrs – 15 yrs	11

AFB smear negative 25 (56.8%) and AFP smear positive 19 (43.18%)

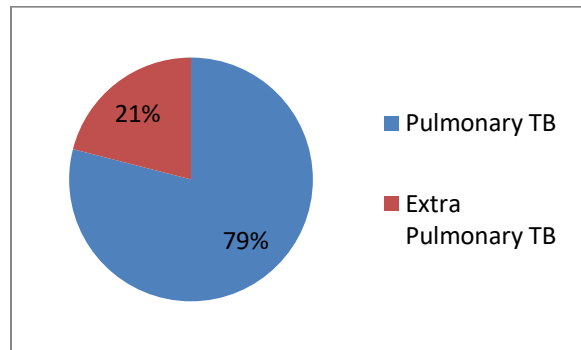


Figure 1: A total of 496 cases of TB were observed in Bethania Hospital out of which 393 (79%) were of Pulmonary TB and 103 (21%) were of Extra Pulmonary TB.

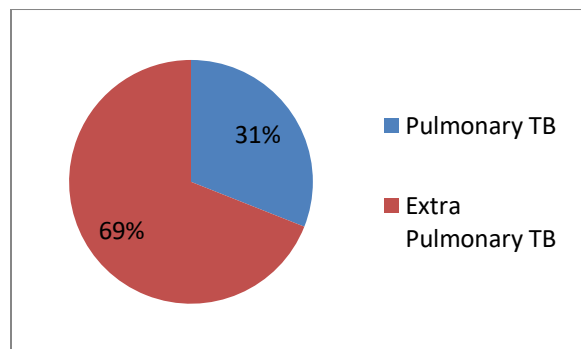


Figure 2: A total of 294 cases of Tuberculosis were observed in AIMTH out of which 109 (31%) were of Pulmonary TB and 185 (69%) were of Extra Pulmonary TB.

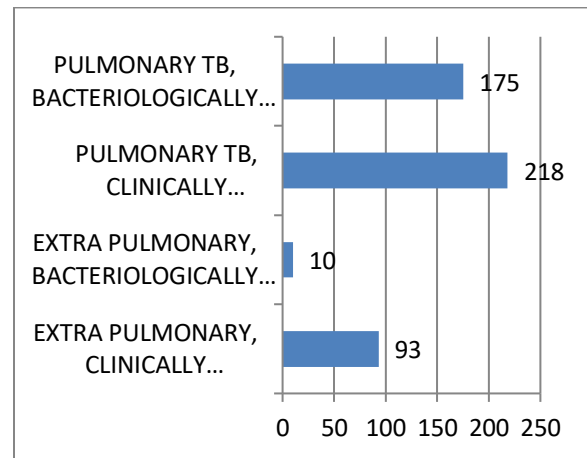


Figure 3: Total number of pulmonary and extra pulmonary cases in Bethania Hospital.

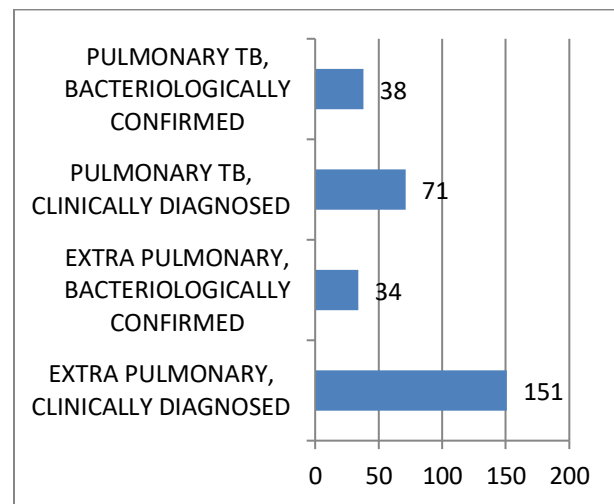


Figure 4: Total number of cases of Pulmonary and Extrapulmonary TB in Allama Iqbal Memorial Teaching Hospital, Sialkot.

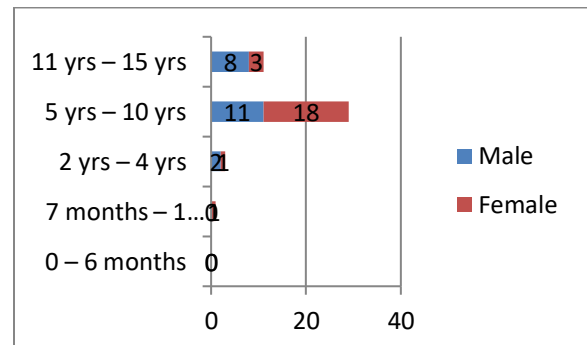


Figure 5: Total cases under 15 years of both hospitals were 44 out of which 21 were male and 23 were female.

Discussion:

Tuberculosis (TB) is a significant public health concern worldwide, including in Pakistan, where it remains a major cause of illness and death among children. TB is an infectious disease caused by the bacteria *Mycobacterium tuberculosis* and in majority affects the lungs, although it can also affect other parts of the body. In Pakistan, TB is a serious health issue, with a high burden of both drug-susceptible and drug-resistant forms of the disease. Children are particularly vulnerable to TB due to their weaker immune systems and increased risk of exposure in crowded and unhygienic environments.

The diagnosis of TB in children can be challenging as their symptoms may be less specific and resemble other common childhood illnesses. Common symptoms include a persistent cough, fever, weight loss, fatigue, and failure to thrive. In addition to clinical examination and medical history, diagnostic tools such as chest X-rays, sputum tests, and tuberculin skin tests (TST) are used to identify TB infection or disease in children.⁶

The management of pediatric TB involves a combination of anti-TB medications and supportive care. The treatment regimen typically includes multiple antibiotics taken over a prolonged period, usually six to nine months. It is essential for children to complete the entire course of treatment to ensure cure and reduce the risk of drug resistance.

Pediatric tuberculosis (TB) cases continue to be a significant concern in public health. The occurrence of pediatric TB cases remains a challenge that requires comprehensive efforts to address and mitigate its impact. Some important risk factors involved in the rapid increase in pediatric TB.

Risk factors:

1. Weakened immune system: Children, especially under 5 years old, have developing immune systems that cannot fight off infections. This makes them more vulnerable to contracting TB when exposed to the bacteria.
2. Close contact with infectious individuals: TB is an airborne disease, primarily transmitted through respiratory droplets. Children are more likely to come into close contact with infected individuals increasing their risk of exposure.
3. Household transmission: Children often spend a significant amount of time in close proximity to family members, including adults who are more likely to have active TB. If a household member has TB, the child has a higher risk of infection.
4. Poor nutrition and health status: Malnutrition and poor overall health can weaken a child's immune system, making them more susceptible to TB infection.
5. Limited access to healthcare: Children from low-income or marginalized communities may have limited access to healthcare services, including TB diagnostic facilities and treatment.

Efforts to control pediatric TB should focus on multiple fronts. Firstly, enhancing public awareness about the signs, symptoms, and risks of TB in children is crucial. This includes educating parents, healthcare providers, and communities about the importance of early detection, prompt diagnosis, and appropriate treatment.

There was no other associated study on TB under 15 years because mostly are concerned with higher age groups including both Pulmonary TB and Extrapulmonary TB. Our research from two different hospitals showed that pediatric TB cases were less frequent mostly belonging to poor under developed areas and those in contact with

TB patient. So this shows that TB in children is mainly a result of exposure which is much less in children as compared to elders.

Conclusion:

In conclusion, pediatric TB poses a significant health challenge globally, requiring specific attention and tailored approaches for diagnosis, treatment, and prevention. Early detection, accurate diagnosis, and appropriate treatment are crucial for improving outcomes and reducing the transmission of TB among children.

Limitations

- Shortage of time
- Restricted resources
- Less frequent cases were observed of pulmonary tuberculosis under 15 year in our area
- Research time span was also short

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