ISSN: 0975-1556

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2021; 13(3); 376-380
Original Research Article

A Cross-Sectional Investigation of Paediatric Tuberculosis Cases Diagnosed by CBNAAT in A Tertiary Care Centre was Conducted

Chandra Bhushan Kumar

Associate Professor, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

Received: 05-07-2021 / Revised: 19-08-2021 / Accepted: 12-09-2021
Corresponding author: Dr. Chandra Bhushan Kumar
Conflict of interest: Nil

Abstract

Background: Pediatric tuberculosis (TB) is different than that in adults in several ways. The diagnosis of TB is more difficult in children due to non-specific or complete absence of symptoms and difficulty in confirming the diagnosis microbiologically. Newer diagnostic methods like Cartridge based nucleic acid amplification tests (CBNAAT) can rapidly identify Mycobacterium tuberculosis with improved sensitivity over the smear testing. **Aim:** To analyze the in-hospital prevalence of Pediatric tuberculosis in children up to 18 years of age. **Material & Method**: This observational record based cross-sectional study was done 1 year in Department of Pediatrics, Patna Medical College & Hospital, Patna, Bihar, India. The study was carried out by analyzing the clinical & laboratory data of 320 patients treated with ATT. **Results**: Data of a total of 320 patients was analyzed. In 21.2% of cases gastric aspirate was sampled and Sputum sample was taken in 78.8 % of cases. Out of them, 146 (45.6%) turned reactive for tuberculosis by CBNAAT. 69.4% of children completed treatment and 30.6% were declared cured. **Conclusion**: This study concludes with 45.6% positivity after CBNAAT testing for tuberculosis infection in collected samples of sputum and gastric aspirate.

Keywords: CBNAAT, gastric aspirate, Pediatric Tuberculosis.

Introduction

Since the declaration by the WHO of a 'global TB emergency' in 1993, a wealth of publications has addressed important aspects of the burden, management and control of tuberculosis (TB). In general, however, the emphasis has been on adult disease. By contrast, pediatric TB has been relatively neglected, mainly due to greater challenges in diagnosis and the lower priority traditionally afforded to children by TB control programs. As a result, both research and surveillance data in the field of childhood TB have been greatly limited. Nevertheless, with roughly a million cases estimated globally each year [1,2].

As in adults the majority of cases occurred in 22 high burden countries, where a combination of high transmission rates and a large proportion of the population under the age of 15 years mean children account for up to 25-40% of cases, with incidence rates for paediatric TB ranging from 60-600 per 100,000 per year [3].

Childhood tuberculosis mostly left unnoticed as there is difficulty in

identification of the organism due to improper sampling as well as low sensitivity of the smear. This leads to difficulty in the detection of cases. [2]

Differences in the pathophysiology and clinical presentation of TB in children make diagnosis more challenging than in adults [4], and definitions of latent infection and disease are less clear cut [5]. Nevertheless, following infection several factors appear to influence the balance of risk between latent TB infection (LTBI) or progression to active disease, including age and nutritional [6], vaccination[7] and immune status [7,8] Children are at much higher risk of progression to active disease than adults [9]. This risk is greatest for infants and children under 2 years of age [6, 10]

Given the scarcity of available data especially in children from resource-limited regions of the country, this cross-sectional study was undertaken to analyze the in-hospital prevalence of Pediatric tuberculosis in children up to 18 years of age.

Methodology:

This observational record based cross-sectional study was done 1 year in Department of Pediatrics, Patna Medical College & Hospital, Patna, Bihar, India.

Inclusion criteria: Pediatric patients of age ranging from six months to 18 years who were diagnosed with Tuberculosis by Cartridge Based Nucleic Acid Amplification (CBNAAT) test done and were treated with anti-tuberculosis therapy (ATT).

Exclusion criteria: Patients out of age criteria and not registered for ATT.

Methodology:

The study was carried out by analyzing the clinical & laboratory data of 320 patients treated with ATT.

Results:

Data of a total of 320 patients were analyzed. Male: female ratio was almost equal i.e. 1.04:1 (Male-170, Female-150). 288 patients were below the poverty line. 68.7% of the patients were from rural areas. 85.6% of patients had a tubercular contact history in the family and almost the same percentage (84.4%) households had a history of smoking in family members. 76.2% had a reactive tuberculin test.

In 21.2% of cases gastric aspirate was sampled and Sputum sample was taken in 78.8 % of cases. Out of them, 146 (45.6%) turned reactive for tuberculosis by CBNAAT. 69.4% of children completed treatment and 30.6% were declared cured.

Table 1: Data of a total of 320 patients

Parameters	Result	Percentage (n=320)
Age-wise distribution		
6-12 months	18	05.6%
1-5 years	44	13.7%
5-10 years	54	16.9%
10-18 years	204	63.7%
Sex wise distribution		
Male	170	53.1%
Female	150	46.9%
Financial condition wise distribution		
APL	32	10%
BPL	288	90%
Area wise distribution		
Rural	220	68.7%
Urban	100	31.2%
Status of smoking in family		

Yes	270	84.4%
No	50	15.6%
History of contact		
Yes	274	85.6%
No	46	14.4%
HIV screening	All	100%
Mantoux test Reactive	244	76.2%
Type of sample		
Sputum	252	78.8%
Gastric aspirate	68	21.2%
CBNAAT results		
Reactive	146	45.6%
Test results		
Treatment completed	194	60.6%
Treatment after default	28	08.8%
Cured	98	30.6%

Discussion:

Diagnostic difficulties pose the greatest challenge to childhood TB management [11]. TB is often not considered in the differential diagnosis in children, especially in low endemic settings. TB can mimic many common childhood diseases, including pneumonia, generalized bacterial and viral infections, malnutrition and HIV. However the main impediment to the accurate diagnosis of active TB is the paucibacillary nature of the disease in children. Younger children also produce smaller amounts of sputum, which is usually swallowed rather than expectorated. Bacteriological samples may be collected by conducting early morning gastric washings, a fairly unpleasant procedure that requires hospital admission and overnight-fast for up to three consecutive nights. Consequently bacteriological confirmation is the exception rather than the rule with only 10-15 % of sputum samples revealing acid fast bacilli (AFB) and culture remaining negative in around 70% of cases with probable TB [12]. Without a definitive diagnosis treatment is therefore often initiated on clinical judgment, aided by algorithms based on exposure history, clinical features, chest x-ray (CXR) and TST [13, 14]

In a study carried out to assess the utility of Xpert assay, out of the 210 gastric aspirate samples, 34 (16.19%) were positive by Xpert assay. For a sample to be positive, 131 CFU/ml of bacilli is required by GeneXpert [15] There is importance of screening the samples by ZN staining and then confirming the diagnosis by culture, as GeneXpert cannot detect the Non-Tuberculous Mycobacteria (NTM) species [16] which is needed to be evaluated further at study centre as it is observed that the overall yield of tubercular infection detected by Xpert is 42% including both sputum and GA samples but rest of the children were clinically diagnosed as tubercular and were treated accordingly.

This is due to the incorrect perception that respiratory specimens are difficult or impossible to obtain in children, the lack of infrastructure or trained staff to obtain such specimens and the lack of policy regarding microbiological confirmation in children. However, the yield of direct acid-fast smear microscopy is also very low since the disease is typically paucibacillary[17]. A meta-analysis of 15 studies, including 3,640 children, demonstrated a sensitivity of Xpert for TB detection of 62% using expectorated or induced sputum, and a sensitivity of 66% using samples from gastric lavage. [18]

This study result shows 51% yield from sputum samples but only 10% reactive from the gastric aspirate. Proper sampling technique, sample transportation and timely processing need to be evaluated separately. A study from Brazil also pointed out the need to standardize gastric lavage protocols for the diagnosis of pulmonary tuberculosis in children[19].

Conclusion:

Despite real progress made by the WHO DOTS strategy in recent years, the global TB epidemic remains an ugly blot on the international public health landscape. TB in children presents particularly difficult challenges, but research priorities and advances in paediatric TB research may also provide wider insights and opportunities for TB control. This study concludes with 45.6% positivity after CBNAAT testing for tuberculosis infection in collected samples of sputum and gastric aspirate.

References:

1. Dolin PJ, Raviglione MC, Kochi A. Global tuberculosis incidence and mortality during 1990-2000. Bull World Health Organ. 1994;72(2):213–20.
2. Nelson LJ, Wells CD. Global epidemiology of childhood tuberculosis. Int J Tuberc Lung Dis. 2004 May;8(5):636–47.
3. Carvalhoa I, Goletti D, Mangac S, Silva DR, et al. Managing latent tuberculosis infection and tuberculosis in children. Pulmonol. 2018;24(2)106-114.
4. Shingadia D, Novelli V. Diagnosis and treatment of tuberculosis in children. Lancet Infect Dis. 2003 Oct;3(10):624–32.
5. Marais BJ, Gie RP, Schaaf HS, et al. The natural history of childhood intra-thoracic tuberculosis: a critical review of literature from the pre-chemotherapy era. Int J Tuberc Lung Dis. 2004 Apr;8(4):392–402.
6. Cegielski JP, McMurray DN. The relationship between malnutrition and tuberculosis: evidence from studies in humans and experimental animals. Int J Tuberc Lung Dis. 2004 Mar;8(3):286–98.
7. Colditz GA, Brewer TF, Berkey CS, et al. Efficacy of BCG vaccine in the prevention of tuberculosis. Meta-analysis of the published literature. Jama. 1994 Mar 2;271(9):698–702.
8. Barnes PF, Bloch AB, Davidson PT, Snider DE., Jr. Tuberculosis in patients with human immunodeficiency virus infection. N Engl J Med. 1991 Jun 6;324(23):1644–50.
9. Beyers N, Gie RP, Schaaf HS, et al. A prospective evaluation of children under the age of 5 years living in the same household as adults with recently diagnosed pulmonary tuberculosis. Int J Tuberc Lung Dis. 1997 Feb;1(1):38–43.
10. Rieder HL. Epidemiology of tuberculosis in children. Annales Nestle. 1997;55(1):1–9.
11. Marais BJ, Pai M. Recent advances in the diagnosis of childhood tuberculosis. Arch Dis Child. 2007 May;92(5):446–52.
12. Zar HJ, Hanslo D, Apolles P, Swingler G, Hussey G. Induced sputum versus gastric lavage for microbiological confirmation of pulmonary tuberculosis in infants and young children: a prospective study. Lancet. 2005 Jan 8-14;365(9454):130–4.
13. Marais BJ, Gie RP, Hesseling AC, et al. A refined symptom-based approach to diagnose pulmonary tuberculosis in children. Pediatrics. 2006 Nov;118(5): e1350–9.
14. Starke JR. Diagnosis of tuberculosis in children. Pediatr Infect Dis J. 2000 Nov;19(11):1095–6.
15. Iram S, Zeenat A, Hussain S, Wasim Yusuf N, Aslam M. Rapid diagnosis of tuberculosis using Xpert MTB/RIF assay Report from a developing country. Pak J Med Sci. 2014;31;105 10.

16. Sharma S, Shulania A, Achra A, et al. Diagnosis of pulmonary tuberculosis from gastric aspirate samples in non-expectorating pediatric patients in a tertiary care hospital. Indian J Pathol Microbiol. 2020;63;210-3.
17. Zar HJ, Hanslo D, Apolles P, Swingler G, HusseyG. Induced sputum versus gastric lavage for microbiological confirmation of pulmonary tuberculosis in infants and young children- a prospective study. Lancet. 2005;365;130–134.
18. Detjen AK, DiNardo AR, Leyden J, Steingart KR, Menzies D, Schiller I, et al. Xpert MTB/RIF assay for the diagnosis of pulmonary tuberculosis in children- a systematic review and meta- analysis. Lancet Respir Med. 2015;3;451–61.
19. Maciel EL, Brotto LD, Sales CM, et al. Gastric lavage in the diagnosis of pulmonary tuberculosis in children- a systematic review. Rev Saúde Pública. 2010;44(4).