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To evaluate the clinical characteristics and microbiological findings in children with suspected pulmonary tuberculosis

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Abstract

Aim: The aim of the present study to evaluate the clinical Characteristics and Microbiological Findings in Children with Suspected Pulmonary Tuberculosis.

Methods: After receiving clearance from the protocol review committee and the institutional ethics committee, the prospective observational study was carried out at the Department of..... This research covered 100 patients. According to the Revised National Tuberculosis Control Program (RNTCP) guidelines published in the Technical and Operational Guidelines for Tuberculosis Control in India 2016, children aged 6 months to 18 years who present with constitutional symptoms such as persistent fever >2 weeks without a known cause and/or unremitting cough for >2 weeks and/or weight loss of 5% in three months or no weight gain in the previous three months along with any one of the following findings, i.e., his The radiology department performed a chest X-ray and reported findings indicative of tuberculosis, such as hilar and paratracheal lymphadenopathy, parenchymal lesions, and cavitary lesions.

Results: The study covered 100 juvenile patients with an average age of 12.044.96 years. In the research, 58 percent of the individuals were older than 11 years old. The study had a female predominance. Only 44 (44%) male patients participated in the trial, compared to 56 (56%) female patients. The most prevalent complaint was fever (84 percent), followed by cough (76 percent). Other major symptoms at the start of the disease were weight loss (88 percent), lack of appetite (86 percent), and shortness of breath (16 percent). Haemoptysis, chest discomfort, and shortness of breath were less common. Out of 100 participants, 22% tested positive for Mycobacterium tuberculosis, whereas the remaining 78 percent tested negative by both ZN staining and CBNAAT. The proportion of CBNAAT positive patients with cavitation on chest X-ray was 63 percent, which was substantially higher than the national average (p=0.0018).

Conclusion: We determined that females were more likely than males to be infected with tuberculosis. The study also discovered that patients with clinical findings indicative of pulmonary Koch's do not necessarily have positive sputum CBNAAT. Sputum positivity was shown to be substantially related to a cavitary lesion on a chest X-ray.

Keywords: Clinical characteristics, microbiological findings, suspected pulmonary tuberculosis

Introduction

Tuberculosis (TB) is one of the world's most serious public health issues ^[1, 2]. In 2015, there were 10.4 million new cases of tuberculosis globally, with 10% of these being paediatric. Six countries accounted for 60 percent of the burden, with India being one of them. 1 India has the highest prevalence of tuberculosis (TB) and multidrug resistant (MDR) TB. The number of TB and children TB cases reported in India in 2015 was 2.8 million and 2 55 000, respectively ^[1]. Childhood tuberculosis (TB) accounts for 10–20% of TB and related mortality in high-burden countries ^[3]. In endemic locations, high case density and delayed diagnosis result in high infection rates in the paediatric population. Childhood tuberculosis is a proxy for the continuous spread and management of adult tuberculosis ^[4].

Because of differences in immunological processes, children are more likely than adults to progress after illness exposure [5]. The clinical spectrum of juvenile tuberculosis may vary based on the balance of pathogen and host immune response. Cases of primary paediatric tuberculosis infection may be asymptomatic, recover spontaneously, or go totally unreported and only be found at a later stage [6]. Children may present with vague symptoms that resemble those of other paediatric disorders, causing a diagnostic lag. Microbiological confirmation is rare due to paucibacillary illness in youngsters and poor sample quality.

Culture sensitivity, the gold standard of diagnosis in adult TB, remains 30–40% in youngsters. Pediatric tuberculosis remains underreported due to a lack of diagnostic techniques and a lack of a gold standard [7]. Pediatric tuberculosis is often diagnosed clinically using contact tracing, history, tuberculin skin tests, radiography, and a lack of response to treatment. The World Health Organization (WHO) and the Revised National Tuberculosis Control Program (RNTCP) recommended the Cartridge Based Nucleic Acid Amplification Test (CB-NAAT) as a preliminary diagnostic tool in children, as it provides rapid identification and rifampicin resistance from direct specimens within 2 hours [7].

Material and methods

After receiving clearance from the protocol review committee and the institutional ethics committee, the prospective observational study was carried out at the Department of.....

Inclusion Criteria

This research covered 100 patients. According to the Revised National Tuberculosis Control Program (RNTCP) guidelines published in the Technical and Operational Guidelines for Tuberculosis Control in India 2016⁸, children aged 6 months to 18 years who present with constitutional symptoms such as persistent fever >2 weeks without a known cause and/or unremitting cough for >2 weeks and/or weight loss of 5% in three months or no weight gain in the previous three months along with any one of the following findings, i.e., his The radiology department performed a chest X-ray and reported findings indicative of tuberculosis, such as hilar and paratracheal lymphadenopathy, parenchymal lesions, and cavitary lesions.

Exclusion Criteria

Children who were already receiving Antitubercular Therapy (ATT) had any unexplained sickness; were asthmatic; had a risk of foreign body aspiration resulting in non-resolving pneumonia; or were HIV positive.

Methodology

A thorough history was collected, and a general examination was performed to look for lymphadenopathy, cutaneous tuberculosis markers, anthropometry, respiratory system abnormalities, and organomegaly. Every kid suspected of having tuberculosis had a Mantoux test, which involved injecting 5TU of tuberculin intradermally into the anterior region of the left forearm. The results were examined between 48 and 72 hours after the injection. Induced induration of less than 5 mm surrounding the injection site was considered negative, whereas induration of 10 mm or more was considered positive [9]. A diagnosis of pulmonary tuberculosis was obtained based on the history, clinical examination, and investigations. Each patient had two sputum samples taken.

One in a sterile specimen cup with a tight-fitting cap was submitted for Ziehl-Neelsen (ZN) staining, while the other in a falcon tube was sent to TB hospital Ambala for CBNAAT, and a report was gathered. CBNAAT is a Polymerase Chain Reaction (PCR)-based technology that may identify Mycobacterium TB and deliver results in 100 minutes. 10

Statistical investigation

Microsoft SPSS version 24.0 and graph pad prism software were used to analyse the data. The Chi-square test was performed to compare properties. The p-value of <0.05 was deemed significant.

Results

The study covered 100 juvenile patients with an average age of 12.044.96 years. In the research, 58 percent of the individuals were older than 11 years old. The study had a female predominance. Only 44 (44%) male patients participated in the trial, compared to 56 (56%) female patients. 1st table.

The most prevalent complaint was fever (84 percent), followed by cough (76 percent) [Table 2]. Other major symptoms at the start of the disease were weight loss (88 percent), lack of appetite (86 percent), and shortness of breath (16 percent). Haemoptysis, chest discomfort, and shortness of breath were less common. Table No. 2

Table 1: Gender and age distribution of patients

Gender	Number of patients	Percentage
Male	44	44
Female	56	56
Age		
Below 6 years	11	11
6-11 years	31	31
11-18 years	58	58
Age mean	12.04±4.96	

Table 2: Clinical symptoms

Symptoms	Number of patients	Percentage
Fever	84	84
cough	76	76
weight loss	88	88
loss of appetite	86	86
Haemoptysis	4	4
chest pain	9	9
breathlessness	16	16

Out of 100 participants, 22% tested positive for Mycobacterium tuberculosis, whereas the remaining 78 percent tested negative by both ZN staining and CBNAAT. 3. Table The proportion of CBNAAT positive patients with cavitation on chest X-ray was 63 percent, which was substantially higher than the national average (p=0.0018). 4th Table

Table 3: Sputum positivity by ZN staining and CBNAAT in overall population.

Sputum Result (ZN staining)	Total Number of patient's N (%)
Positive	22 (22%)
Negative	78 (78%)
Sputum Result (CBNAAT)	
Positive	22 (22%)
Negative	78 (78%)

Table 4: Comparison between cavitation and sputum positivity.

	Sputum positive patients	Sputum negative patients	p-value
Cavitation present	15	15	0.0018
Cavitation absent	7	63	

Discussion

Pediatric tuberculosis is difficult to diagnose due to its nonspecific presentation and lack of microbiological proof due to the disease's paucibacillary origin. Children's tuberculosis is a direct result of adult tuberculosis and is an excellent indicator of current transmission in the community. The patient's age and immunological condition are the two most important factors in determining the likelihood of illness development. With a greater proportion of military TB and meningeal involvement, neonates are at a higher risk of infection progressing to illness. Children aged 5 to 10 years are less prone than other age groups to develop illness, while teenage patients might appear with progressive primary pulmonary TB or cavitory disease [11].

There was a female majority in this study. Only 44 (44%) male patients participated in the trial, compared to 56 (56%) female patients. There is no credible evidence that pulmonary tuberculosis has a sexual preponderance; yet, pulmonary tuberculosis was found to be more frequent among females than men in the current study, as indicated by the majority of writers [12, 13]. In the current investigation, 88% of the ladies were determined to be malnourished. As a result, it is reasonable to speculate that the increased incidence of sickness in females might be due to neglect of the girl child in the region, which leads to low nutritional condition, making them more prone to the disease. Fever, cough, and weight loss are the most typical symptoms in symptomatic children suspected of having pulmonary tuberculosis. The most prevalent symptom in the current research was fever (84 percent), followed by cough (76 percent) (76 percent). The findings were consistent with the bulk of the authors' descriptions, with fever being the most prevalent manifestation [14-16]. Other major symptoms at the start of the disease were weight loss (88 percent), lack of appetite (86 percent), and shortness of breath (16 percent). To minimise the spread of tuberculosis, early identification and treatment are crucial. Sputum microscopy for AFB with ZN staining is a straightforward, quick, and inexpensive technique for diagnosing pulmonary tuberculosis.

CBNAAT has just been recommended by WHO for the diagnosis of tuberculosis since it is not only more sensitive but also detects rifampicin resistance. The current investigation compared the sputum findings acquired by ZN staining and CBNAAT. In the current investigation, out of 100 people suspected of having pulmonary tuberculosis, only 22 (22%) tested positive for AFB by ZN staining and CBNAAT. The remaining 78 individuals (78 percent) tested negative for both ZN staining and CBNAAT. The findings of the current study differed from those of other writers.

Alvarez-Uria G *et al.* concluded that 69 percent of patients had smear positive against CBNAAT, whereas 75 percent of patients had smear positivity [17]. In a comparable research, Dewan R *et al.* found that ZN staining exhibited sputum positive in 11% of patients compared to CBNAAT, which showed sputum positivity in 40% of patients. 10 The disparities are more likely due to the fact that the sufficiency of the sputum samples was not considered during sample collection. Furthermore, the paucibacillary character of tuberculous bacilli in sputum samples produces misleading

negative findings, as evidenced by the literature [18].

Sputum positive was also found to be considerably greater in patients with a history of contact or exposure in the current investigation. In investigations undertaken by Sekadde MP *et al.* and Arora A *et al.*, respectively, there was a significant correlation between history of contact and sputum positive [19] a cavitory lesion on a chest X-ray is a distinguishing feature that indicates the existence of progressing primary illness or adult-onset tuberculosis in children. The proportion of sputum positive patients with cavitation was observed to be considerably greater in the current investigation (p=0.0018). Cavitation is important in tuberculosis because it allows bacteria to communicate with the environment, resulting in an oxygenated environment inside the cavitation and bacterial multiplication [20].

Conclusion

We determined that females were more likely than males to be infected with tuberculosis. The study also discovered that patients with clinical findings indicative of pulmonary Koch's do not necessarily have positive sputum CBNAAT. Sputum positivity was shown to be substantially related to a cavitory lesion on a chest X-ray.

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