

Original Research Article

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A study on prevalence of symptomatic not confirmed pulmonary tuberculosis under 5 to 15 years of age in protein energy malnutrition children in a tertiary care centre

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ABSTRACT

Background: Tuberculosis (TB) and malnutrition are important causes of morbidity and mortality in children, in developing countries. Tuberculosis can be a cause of malnutrition in children and also a common cause of pneumonia in such malnourished children. In the present study, our aim is to know the prevalence and early clinical diagnosis of symptomatic not confirmed TB, in recent challenging environment, in protein energy malnutrition children, this information would certainly help clinicians in early detection, diagnosis and management of PTB (Pulmonary Tuberculosis) in such populations, to reduce morbidity and mortality.

Methods: We prospectively investigated protein energy malnutrition children, with clinical features of tuberculosis, between 5 to 15 years of age, admitted during 18 months of study period. Clinical and demographic data of studied children were collected. Anthropometric (Height and Weight) measurement and physical examination were made. PEM (Protein energy malnutrition) children were classified according to Indian academy of pediatric classification. History of BCG vaccination and exposure to contact were inquired. Chest radiography was done for all children in our study.

Results: A total of 150 protein energy malnutrition children, between 5 to 15 years, admitted over 18 months period were studied. Majority of children were female as compared to male and under 5 to 10 years of age. Out of these, symptomatic not confirmed pulmonary TB 93 (62%) and Extra pulmonary TB 18 (12%) and Non TB cases were 39 (26%). According to Grade of PEM, symptomatic not confirmed pulmonary TB cases under grade III were 45 (48.5%) and 35 (37.6%) were under grade II.

Conclusions: Pulmonary tuberculosis may be a common cause of pneumonia in malnourished children and the cause of death in these population. So Its frequency and early clinical detection, even without microbiological confirmation and supportive evidence and treatment guideline should be made by more further study. So that, it will help clinicians to treat these population to reduce morbidity and mortality.

Keywords: Lymph node, *Mycobacterium tuberculosis*, PTB, Tuberculin skin test, PEM

INTRODUCTION

Tuberculosis is a preventable and treatable disease, that can cause malnutrition in children. It is also, a common problem in such malnourished children.¹ The mortality

rate from pulmonary TB (PTB) is high among severe acute malnutrition children, who are mostly presenting with pneumonia.² There is also strong evidence that, by suppressing T-helper-1 and macrophage functions, the primary malnutrition raises the incidence and exacerbates

clinical manifestations of tuberculosis in protein energy malnutrition children.³ In adults, TB primarily causes respiratory disease, whilst in children, in addition to pulmonary tuberculosis, extra pulmonary disease such as lymphadenopathy, disseminated disease (miliary TB) or meningitis also common.^{4,5} Again it's a challenge in confirming a diagnosis, in the context of, difficulties in obtaining high quality specimens, the paucibacillary nature of the disease and lack of mycobacterial culture facilities and delay in getting results of culture and susceptibility in malnourished children.

In the present study, our aim is to know the prevalence and diagnosis of symptomatic not confirmed TB under 5 to 15 years of age, in protein energy malnourished children. So that we can easily detect and manage, the cases in early to reduce morbidity, and mortality in these children.

METHODS

This prospective study was conducted, over protein energy malnutrition children, between 5-15 years of age, who were admitted in paediatric ward in the Department of Paediatric, of GVMC and Hospital, Visakhapatnam, from August 2017 through March 2019, with institutional ethical approval. The children included in this study, were classified according to the Indian Academy of Paediatric classification (Weight expected for age), grade I (71-80%), grade II (61-70%), grade III (51-61%), grade IV (<50%) with respiratory symptoms (cough >2 weeks, low grade fever, loss of weight, loss of appetite) and symptom of extra pulmonary tuberculosis such as cervical lymphadenopathy. Children, whose parents or attending guardians did not give consent or had left the hospital, were not included in this study. In all cases, Clinical and demographic data were collected. Anthropometric (Height and Weight) measurement and physical examination were made. History of BCG vaccination was inquired and scar examined. A detailed history of exposure to contact was inquired. Chest radiography was done for all study children. Presence of primary complex in chest radiograph with clinical history, were taken as positive symptomatic cases.

For purpose of this study, the cases were classified as:

- Symptomatic TB cases were, those children who had typical PTB-related symptoms like cough >2 wks, low grade fever, loss of wt, loss of appetite) and of

extra pulmonary tuberculosis such as Anterior cervical lymphadenopathy (size >1 cm) and parenchymal abnormalities on chest radiograph.

- Confirmed TB means identification of *M. tuberculosis* by culture or by Xpert MTB.
- Not confirmed TB means when a clinical diagnosis was not confirmed microbiologically with supportive evidence such as positive TST or a positive contact history.
- Not TB means Children had no PTB-related symptoms or left the hospital or did not get consent from their parents for this study.

Statistical analysis

The data was collected using MS excel sheet and analysed. Summarization of data was presented using basic tables. Clinical and Categorical variables were presented as frequency and percentage.

RESULTS

During the study period, total 150 protein energy malnutrition children were included, according to IAP classification, from August 2017 to March 2019, who had admitted in paediatric ward, in the Department of Paediatric, GVMC, Visakhapatnam, Andhra Pradesh, India.

Majority of children in our study group, were female 83 (55.4%) as compared to male 67 (44.6%). Again, most of the children, both male and female, were under 5-10 years age group (Table 1).

Table 1: Distribution of PEM children according to age and sex.

Sex	Age		Percentage (%)
	5-10 yrs	11-15 yrs	
Male	45	22	(67) 44.6%
Female	56	27	(83) 55.4%

In the present study, according to type of TB found in PEM children, Symptomatic TB cases were 111 (74%), where symptomatic not confirmed pulmonary TB 93 (62%) and Extra pulmonary TB 18 (12%). Non TB cases were 39 (26%). Out of 93 symptomatic not confirmed pulmonary TB cases, 40 (43.1%) male and 53 (56.9%) were female children.

Table 2: Distribution of type of TB in PEM children according to their presentation.

Type of TB in PEM children	Number (n)			Percentage (%)
	Male	Female	Total	
Symptomatic TB	Pulmonary	40	53	93 62%
	Extrapulmonary (LN)	08	10	18 12%
Not TB		25	14	39 26%

According to Grade of PEM, 45 (48.5%) symptomatic not confirmed pulmonary TB cases were under grade III and 35 (37.6%) were under grade II. Majority of the cases under grade III were female children, whereas male were in grade II. The Symptomatic children under grade IV and I were (7) 7.5%, (6) 6.4% respectively.

Table 3: Distribution of Symptomatic not Confirmed Pulmonary TB cases according to different grade of PEM (Based on IAP classification).

PEM	Number of symptomatic pulmonary TB cases (n)			Percentage (%)
	Male	Female	Total	
Grade-I	03	03	06	6.4%
Grade-II	19	16	35	37.6%
Grade-III	18	27	45	48.5%
Grade-IV	00	07	07	7.5%

DISCUSSION

Tuberculosis and malnutrition are important causes of morbidity and mortality in children. Also, World Health Organization (WHO) states that malnutrition is a significant risk factor for childhood tuberculosis. Once children become infected with TB, this may progress more rapidly into PTB in them, compared to other forms of TB. The risk of disease after primary infection with TB is as high as 50% in infants below the age of one year, 10-20% in children aged 1-2 year(s), 5% in children aged 2-5 years, and only 2% in children aged 5-10 years. The risk increases to 10-20% for children older than 10 years.^{6,7}

Severe acute malnutrition is associated with serious lower respiratory tract infections including TB and pneumonia and facilitates the rapid progression of TB infection to active disease due its immunosuppressive effect.^{8,9} In our study, the symptomatic not confirmed pulmonary TB cases were 45 (48.5%) under grade III and 35 (37.6%) were under grade II and very less number of children under grade I and IV. One study on prevalence of TB, according to PEM status was done by Sushmabhai et al, who observed that, 37% cases has grade I and grade II PEM, and 5% cases has grade III PEM with no cases under grade IV.⁹ Another study by Vijayakumar M et al, over severe Malnutrition and childhood tuberculosis, where they found, TB was more with Kwashiorkor (47%) compared to marasmic-kwashiorkor (24%) and marasmus (29%) and Twenty-five percent (37/151) of the cases were bacteriologically confirmed.¹⁰

Studies have shown that children who were vaccinated with BCG had significantly lower tuberculin skin responses if they had severe protein deficiency.^{11,12} Although milder forms of malnutrition may not have deficits in tuberculin response, a prospective study among infants vaccinated at birth with BCG showed that mildly

or moderately malnourished children still had a decrease in tuberculosis-associated cell-mediated immune responses.^{13,14}

The gold standard for diagnosing TB disease is culture of MTB but obtaining suitable samples for culture in children is very difficult, as they are unable to produce sputum and infections tend to be pauci-bacillary (low numbers of bacilli). Again, the gold standard of diagnosis, culture confirmed TB is of limited use in severely-malnourished children due to the paucibacillary (low numbers of bacilli). nature of the disease and poor bacteriologic yields, as cavitation happens rarely in the expansion of the primary focus in malnourished children.¹⁵ On the other hand a set of methods based on immune memory response to MTB, for diagnosing TB infection, failed to diagnosing active infection due to depressed delayed-type hypersensitivity responses, which reduce the sensitivity of tests in malnourished children.¹⁶ So WHO guidance indicates that TB diagnosis in children should be based on clinical features, supported by culture and microscopy, chest radiograph and where available, TST/IGRA. As MTB takes weeks to grow in culture, it is appropriate to start treatment on the basis of clinical features before receiving confirmation by culture in malnourished children to prevent early mortality.

Failure to gain weight despite consuming appropriate quantities of therapeutic feeds for a week or two, ongoing fevers despite a course of antibiotics, or even persistent anorexia, should lead to strong consideration of a diagnosis of TB in malnourished children. In practice, empiric treatment will often be warranted, and treatment should never be delayed by waiting for culture results.

CONCLUSION

PTB may be a common problem in malnourished children in developing countries. So, the frequency and improved early case detection of PTB in malnourished children should be further investigated. This information would certainly help clinicians in early detection, diagnosis and management of PTB in such populations, to reduce morbidity and mortality.

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