



TO STUDY CBNAAT OF GASTRIC ASPIRATE IN SEVERELY ACUTE MALNOURISHED CHILDREN: A HOSPITAL BASED PROSPECTIVE STUDY

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ABSTRACT **Background:** Tuberculosis and malnutrition are important causes of morbidity and mortality in children in the developing world and it is difficult to diagnose tuberculosis in them due to unavailability of good sputum specimens from children and paucibacillary nature of biological samples. This study was conducted to know the yield of CBNAAT of gastric aspirate in SAM children. **Methodology:** A Hospital Based Prospective Study conducted on all children aged 1 month to <5 years with severe acute malnutrition admitted at MTC of Balchikitsalya, RNT Medical College, Udaipur, Rajasthan during the period of last one year with either history of contact or having prolonged illness and given consent for study. Known case of heart disease, lung disease and not consenting for the study were excluded. **Result:** 120 children were enrolled, with mean age of 17.18 ± 11.47 months, out of which 73 were males and 47 females. Most common presenting complaints were fever (70.83%), cough (34.16%), loose stools, vomiting (17.5%) and difficulty in breathing (13.33%). History of contact with tuberculosis patient was present in 10 children. BCG scar mark was present in 74. Mantoux test was positive in 3 while abnormal chest X-ray findings were present in 62. CBNAAT of gastric aspirate was sent of all patients, Mycobacterium tuberculosis was detected in 12 patients, none of which showed rifampicin resistance. Sensitivity of CBNAAT of gastric aspirate for TBME was 66.67%, specificity 95.37% and positive predictive value and negative predictive value were 61.54% and 96.26% respectively. While for Pulmonary tuberculosis sensitivity, specificity, positive predictive value and negative predictive value were 50%, 97.22%, 66.67% and 94.59% respectively. **Conclusion:** Prevalence of Tuberculosis in SAM patients is 10% in our study. Though sensitivity of CBNAAT of gastric aspirate is low but its specificity is high.

KEYWORDS : Severe Acute Malnutrition, Tuberculosis, Gastric Aspirate, CBNAAT.

INTRODUCTION:

Tuberculosis (TB) is a communicable disease and a major cause of ill health. It is the 13th leading cause of death and the second leading infectious killer after COVID-19.^[1] About a quarter of the world's population is infected with M. tuberculosis and thus at risk of developing TB disease.^[2] Global TB report 2018 reports that in India, an estimated 2.2 lakh children become ill with tuberculosis (TB) each year (22% of global TB burden), with a slightly higher burden among males.^[3]

Severe acute malnutrition (SAM) is a major public health problem, especially among under-five children in developing countries. Owing to reduced immunity, children with SAM are at a higher risk of acquiring infectious diseases including Tuberculosis (TB), which is a major contributor to high mortality among these children.^[4]

Diagnosis of pulmonary tuberculosis in children is challenging as it is largely based on clinical, radiological findings and medical history.^[5] Bacteriological confirmation becomes difficult due to unavailability of good sputum specimens from children, inadequate clinical sample volume and paucibacillary nature of biological samples and also unavailability of simple diagnostic tests with high sensitivity.

Introduction of CBNAAT (Xpert MTB/RIF) assay has significantly transformed the diagnostics of tuberculosis. It is now a days most widely used, easily available, cheap, sensitive and specific test for diagnosis of tuberculosis. Pediatric studies reveal that, compared to culture, the sensitivity and specificity of Xpert is 62% and 98% on induced or expectorated sputa and 66% and 98% on gastric aspirates, respectively. Compared with smear microscopy, Xpert improved the sensitivity of detecting pediatric TB cases by 36–44%.^[6] Since our institute also has provision for CBNAAT, we have used it as a diagnostic tool in our study.

MATERIALS AND METHODS:

A hospital based prospective study conducted at Malnutrition Treatment Centre at Balchikitsalya of MBGH, RNT Medical College, Udaipur, Rajasthan from August 2020 to August 2021. Ethical clearance was taken from Institutional Ethics Committee.

Inclusion And Exclusion Criteria

Children aged 1 month to < 5 years with severe acute malnutrition

admitted at MTC with either history of contact or having prolonged illness and consenting for study were included in the study while known case of heart disease, lung disease and not consenting for the study were excluded. A detailed history was taken, clinical examination including anthropometry was done according to standardized methodology. All these were documented in preformed proforma. Complete blood count, chest X-ray, mantoux test was done. BCG scar was ascertained. Single sample of gastric aspirate of each patient was sent for CBNAAT.

Selection Of SAM Patient

Those patients were selected who fulfill any of the following WHO criteria defined for SAM:-

1. Weight for height < -3 SD
2. MUAC < 11.5 cm
3. Bilateral symmetrical pedal edema present

Data Analysis

All collected data was entered in MS excel sheet. Mean values were calculated for age, height, weight, MUAC and HC. Sensitivity, specificity, positive predictive value and negative predictive value were calculated for CBNAAT by using Chi square test as statistical test. Data was analysed with standard software of biostatistics (SPSS version 20). Statistical analysis of the data was done using appropriate test with significance $p < 0.05$.

RESULTS:

Total 120 children were enrolled in this study, out of which 73 (60.83%) were males and 47 (39.16%) females. Mean age was 17.18 ± 11.47 months with maximum patients lying in age group 6-24 months i.e. 80%. The baseline characteristics of children taken in the study is showed in Table 1. Most common presenting complaints were fever 85 (70.83%), cough 41 (34.16%), loose stools and vomiting 21 (17.5%) and difficulty in breathing 16 (13.33%). History of contact with tuberculosis patient was present in 10 (8.33%) out of 120 children. BCG scar mark was present in 74 (61.66%) children.

Table 2 shows diagnostic tests performed in all patients with their results. Mantoux test was positive in 3 (2.50%) while abnormal chest X-ray findings were present in 62 (51.67%) patients. On CBNAAT of gastric aspirate, Mycobacterium tuberculosis was detected in 12 (10%) patients, none of which showed rifampicin resistance.

Table 3 Shows sensitivity ,specificity , positive predictive value and negative predictive value in different clinical conditions.

Table 1: Baseline Characteristics Of Children (n=120)

Characteristics	Variables	Number (%)
Age	<6 months	6 (5)
	6- <24 months	96 (80)
	25- <60 months	18 (15)
Gender	Male	73 (60.83)
	Female	47 (39.16)
Socio-economic status	Upper	0 (0)
	Upper middle	6 (5)
	Lower middle	0 (0)
	Upper lower	24 (20)
	Lower	90 (75)
Criteria for SAM	Weight for height <-3SD	99 (77.50)
	MUAC <11.5cm	71 (59.17)
	B/L Pedal edema	27 (22.50)
History of contact with TB	Present	10 (8.33)
	Absent	110 (91.66)
Immunization status	Complete	75 (62.50)
	Incomplete	45 (37.50)
BCG scar mark	Present	74 (61.66)
	Absent	46 (38.33)
Major presenting complains	Fever	85 (70.83)
	Cough	41 (34.16)
	Loose stools, vomiting	21 (17.50)
	Difficulty in breathing	16 (13.33)

Table 2: Tests Performed With The Results

Tests	Findings	Number (%)
Mantoux test	Positive	3 (2.50)
	Negative	117 (97.50)
Chest X-ray	Heterogenous opacities	29 (24.17)
	Consolidation	10 (8.33)
	Hilar lymphadenopathy	10 (8.33)
	Hyperinflation	6 (5.00)
	Miliary TB	4 (3.33)
	Pleural effusion	2 (1.66)
	Cardiomegaly	1 (0.83)
	Normal	58 (48.33)
CBNAAT of gastric aspirate	M.tb detected	12 (10)
	M.tb not detected	108 (90)

Table 3: Sensitivity And Specificity Values Of CBNAAT In Different Clinical Conditions

Disease	Sensitivity (in %)	Specificity (in %)	Positive Predictive value (in %)	Negative Predictive value (in %)
TBME	66.67	95.37	61.54	96.26
Pulmonary TB	50	97.22	66.67	94.59

DISCUSSION:

Tuberculosis (TB) and malnutrition are important causes of morbidity and mortality in children in the developing world^[7,8]. And Malnutrition is also highly prevalent in children living in tuberculosis endemic countries and contributes to 2.2 million deaths in children under 5 years of age globally^[9].

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^[10,11,12]. SAM affects both acquired and innate host defense mechanisms^[13,14].

Family history of contact with tuberculosis is a significant risk factor for these children. Children under 5, especially under 1 year of age, who come in contact with TB source case usually have 50% chances to develop TB and 95% of the cases develop TB within 1 year of the exposure^[15]. Mantoux test is often negative in SAM children due to the poor inflammatory response. Positive Mantoux test in SAM children increases the chances of having TB, more so if associated with abnormal (patchy/or lobar consolidation) chest radiography.

In our study, 10 (8.33%) children had history of contact with tuberculosis and Mantoux test was positive in 3(2.5%) children.

Abnormal chest X-ray findings were present in 62(51.67%) children. CBNAAT of gastric aspirate detected Tuberculosis in 12(10%) out of 120 children. Clinically diagnosed Tuberculosis cases were 9(7.5%) out of 120.

In a similar study conducted by Shruthi S et al^[16], showed that history of contact with tuberculosis patients was present in 2 out of 29 patients i.e 6.89% In their study 2 (6.89%) children out of 29 showed positive Mantoux test. Abnormal chest X-ray findings were present in 44.83% patients. While 16 (55.17%) patients had normal chest X-ray. Total 3(10.34%) children out of 29 tested positive for Mycobacterium tuberculosis by CBNAAT of gastric aspirate, which is similar to our study.

Our study showed less sensitivity of CBNAAT of gastric aspirate for TBME and pulmonary TB i.e. 66.67% and 50% respectively. While specificity for TBME and pulmonary TB is high i.e. 95.37% and 97.22% respectively. There were 2 children out of 120 who did not show any sign of TB but were diagnosed with it on CBNAAT of gastric aspirate.

Arora A et al^[17], in their study showed sensitivity of 76.1% and specificity of 98.7% for CBNAAT on gastric aspirate samples of children suspected to be suffering from tuberculosis. Positive predictive value and negative predictive value were 94.1% and 93.9% respectively.

Champatiray J et al^[18], conducted CBNAAT on various body fluid samples other than blood, urine and stool, out of 45 TB patients 30 were positive. Their study showed sensitivity of 66.7% and specificity of 100%.

CONCLUSION:

CBNAAT of gastric aspirate showed less sensitivity, therefore cannot be recommended for screening tool but showed high specificity and hence can be used as a diagnostic tool for confirmation of tuberculosis.

LIMITATIONS:

Only one sample of gastric aspirate was sent for CBNAAT rather than three samples on consecutive three days as per recommendations.

RECOMMENDATION:

Sending three samples could have increased the yield of Mycobacterium tuberculosis detection by CBNAAT. For confirmation of tuberculosis CBNAAT can be used in children because of its high specificity and high negative predictive value.

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