Assessment of prevailing practices for identification of tuberculosis in children admitted in nutritional rehabilitation centres: A multicentre study

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Background & objectives: To eliminate tuberculosis (TB), the National TB Elimination Programme (NTEP) has given an algorithm for diagnosis and treatment of TB in children. This study was carried out to assess the prevailing practices to identify TB in severely malnourished children admitted to various nutrition rehabilitation centres (NRCs).

Methods: A retrospective chart review of 41 NRCs across five States having a maximum number of NRCs was carried out. Details of children admitted to the NRCs and the investigations carried out in the form of obtaining X-ray film, tuberculin skin test (TST) and gastric aspirate for cartridge-based nucleic acid amplification test (CBNAAT) for diagnosis of TB over three months were collected.

Results: A total of 2121 children with severe acute malnourished (SAM) across 41 NRCs (Bhopal, Jodhpur, Patna, Kolkata, Lucknow, and Ratlam) were evaluated. X-ray of the chest was done in 473 (22%), TST was done in 135 (6%) and gastric aspirate was collected in 56 (3%) children. CBNAAT was done in only 56 SAM children. Ten children among those screened were confirmed to have pulmonary TB and were linked to treatment as per the National TB guidelines.
Tuberculosis (TB) is a common cause of morbidity and mortality in children. Malnourished children specifically below five years are at a greater risk of mortality because of more disseminated disease. Diagnosis of TB is challenging in children because of paucibacillary disease and difficulty in obtaining appropriate samples. The Indian Academy of Pediatrics and National TB Elimination Programme (NTEP) developed an algorithm for the identification of children with pulmonary TB (PTB)\(^1\).

Young children are most vulnerable to developing severe forms of TB and are over-represented among TB deaths\(^2\). The Ministry of Health and Family Welfare, Government of India, under its National Rural Health Mission initiative, has established nutritional rehabilitation centres (NRCs) across the country to comprehensively manage children with severe acute malnutrition (SAM). These specialized centres run clinics for children are staffed by a paediatrician and trained staff and are equipped with 10-20 beds and other relevant facilities including those for TB screening and management\(^3\). Operational guidelines of NRCs emphasize on actively identifying TB in all children admitted to the NRCs\(^3\). It is important to timely assess the efficiency of implementation of these guidelines aimed at screening for TB in NRCs and any challenges associated with implementation. This study was undertaken to assess the prevailing practices used to identify TB in severely malnourished children admitted to the NRCs and gaps in practices to improve operational aspects.

**Material & Methods**

This multicentre study was part of a project to identify pulmonary TB (PTB) using molecular tests on gastric aspirate in children admitted to the NRCs. Approvals from the Institute Ethics Committees and the State Health Authorities were obtained before conducting the study at each site. The first phase of the project was to assess retrospectively the prevalence of PTB and prevailing practices to identify these children in NRCs across India. The study was conducted between March 2019 to March 2021, at 41 NRC sites, namely NRCs in and around major cities (Bhopal, Jodhpur, Patna, Kolkata, Lucknow and Ratlam). The Indian Council of Medical Research (ICMR) was the central coordinating unit and the study was monitored by All India Institute of Medical Sciences (AIIMS), New Delhi. A data extraction programme was developed and sent to all NRCs through site principal investigators (PIs). The data extraction programme included information on all admissions, age of children in months, anthropometric parameters, whether child was subjected to X-ray film, gastric aspirate for cartridge-based nucleic acid amplification test (CBNAAT) and tuberculin skin test (TST). The NRCs were asked to fill in information if a diagnosis of probable or confirmed TB was made. Medical officers in each NRC sent data to site PIs. After checking data, all site PIs transferred collected data to AIIMS, New Delhi electronically.

**Statistical analysis:** Data received from all the sites were compiled, and missing data were collected by communication with each site investigator. Analysis included proportion of children subjected to chest X-ray, gastric aspirate, TST and diagnosis of TB.

**Results & Discussion**

A total of 2121 SAM children were admitted to these NRCs over three months. Details of total and site-wise enrolment and investigations with diagnosis of TB are given in the Table. Investigations in the form of X-ray film of the chest, TST and gastric aspirate for CBNAAT were carried out in 473 (22%), 135 (6%) and 56 (3%) patients, respectively. A diagnosis of probable or confirmed TB was made in 10 (0.5%) children across all the NRCs. Separate data on the basis of making diagnosis as well as probable or confirmed TB were not available. The overall results suggested a wide variation in the number of children admitted in NRCs, investigations carried out and the number of children diagnosed with TB. The results also suggested
that the investigations carried out to identify TB in the admitted children were minimal and possibly led to underdiagnosis of TB.

In this multisite retrospective study a gross underutilization of available investigations to diagnose TB in children admitted in the NRCs was observed and this was reflected in gross underdiagnosis of PTB in these high risk children. This study was also focussed to assess the gaps between the prevailing practices and policies and we could document a wide gap between the practice and policies. Gross underutilization and underdiagnosis of PTB across NRCs may be due to multiple causes including lack of awareness and training of healthcare workers, difficulty in getting X-rays done; obtaining appropriate purified protein derivative (PPD) to carry out TST and logistics of obtaining gastric aspirates and sending those to appropriate laboratories to get CBNAAT done.

The NTEP recommends upfront X-ray film of the chest and testing of sputum and/or gastric lavage with a molecular TB diagnostic test among all suspected paediatric PTB patients. However, data from these NRCs showed gaps in using CBNAAT as first-line testing. Only 56 SAM children were tested, representing a figure of less than 0.5 per cent of eligible children. Though the reasons for less number of procedures carried out could not be ascertained, it could be non-availability of the trained staff for carrying out the gastric lavage and, the sample transportation issues for the CBNAAT testing. The indigenous molecular test TRueNat MTB and TrueNat MTB Rif approved for use under the NTEP in India have also been endorsed by the WHO in January 2020 as initial tests for the diagnosis of TB and rifampicin resistance.

Although it is known that there is a wide gap between recommendation of the national guidelines and prevailing practices, yet there are limited studies to document this extent of gap. Documentation of actual situation may help the policymakers to identify and rectify reasons for existing gaps. In the Indian context, studies looking at efficiency of implementation of guidelines aimed at screening for TB in NRCs are largely unknown, except a limited number of selected NRCs in Karnataka and Bihar where it has been found to be below par. It is important to concentrate efforts on missed opportunities in preventing morbidity and mortality from TB among these children.

Limitations of our study were that it was retrospective data extraction, and we could not explore reasons for gross underutilization and underdiagnosis of TB in this high-risk group of children. But our study included NRCs strategically located in different parts of the country to give broader insights and revealed important areas to concentrate efforts and overcome missed opportunities.

To conclude, significant gaps were observed in prevailing practices and policies in the diagnosis of TB in vulnerable group of severely malnourished children admitted in the NRCs. There is a need to identify reasons for underutilization and take corrective actions.

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