

Screening of children for tuberculosis

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Abstract

The diagnosis of TB among children presents difficulties in view of non-specific symptoms and absence of single reliable diagnostic test. Children should first be screened for the presence/absence of suggestive symptoms, under-nutrition, presence of history of contact with a case of pulmonary TB and a positive tuberculin test. Based on the results of screening, children with suspicion of TB may be further investigated by X-ray, bacteriological or other investigations for establishment of TB diagnosis.

Keywords: Tuberculosis, children, diagnosis

Background

India tops the list of 22 countries with highest burden of TB in terms of absolute numbers of incidence cases each year¹. Consequently, children are at a high risk of contracting tuberculous infection and subsequently progressing to disease. Serious and fatal manifestations of TB occur in a higher proportion of paediatric TB cases when compared to adults who mostly suffer from post-primary forms (cavitary type) of pulmonary TB. This is a cause of concern, since children in the age group 14 years and below constitute a little more than 1/3rd of the total population².

The extent of TB in children is a reflection of the pool of infectious smear positive pulmonary TB cases among adults in the community. It is rightly said that adult TB is the fountain head of paediatric tuberculosis³. Though BCG vaccination administered within one year of birth is supposed to prevent fatal haematogenous forms of TB, it may not prevent the child from developing adult forms of TB in later part of the life. Though, the life time risk of progression from infection to disease in the general population is 10-15%, half

of that risk is in the first five years of acquiring infection⁴. Hence, children are likely to be affected with serious and fatal haematogenous forms of TB within the first five years of acquiring the infection. This underlines the need for early diagnosis and treatment of TB.

Unlike in adults where sputum examination may suffice for diagnosis of pulmonary TB, it is often difficult to arrive at a prompt and accurate diagnosis in children suspected to be suffering from TB. Diagnosis poses technical and operational challenges due to the abacillary nature of the disease among them and lack of a single, simple, inexpensive and reliable test for diagnosis of TB. The symptomatology is often vague and non-specific. There are complexities involved in the interpretation of tuberculin test and chest X-ray films and collection of sputum specimen is often difficult. In addition, a lack of index of suspicion by staff in peripheral health institutions, their inadequate clinical experience besides the absence of clear guidelines may further delay accurate diagnosis and effective treatment. Though there are many scoring methods available for the diagnosis of TB among children, a universally acceptable, reliable and practically applicable method is yet to find a consensus. Given this diagnostic dilemma, clinicians usually apply a set of criteria rather than a single diagnostic procedure for the diagnosis of TB in children. Children are first screened for the presence/absence of certain relevant factors. These factors if present can be considered as predictors of the disease and children can be further subjected to diagnostic tests like X-ray, bacteriological and other investigations. This article intends to provide simple guidelines for screening of children for TB.

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Relevant factors and their predictive value.

Based on substantial experience gained at National Tuberculosis Institute, Bangalore (NTI) and other parts of the world, four clinical criteria are considered relevant for screening the children for TB. These are:

1. Failure to thrive and non-specific symptomology
2. Under-nutrition
3. History of contact with a known case of pulmonary tuberculosis (in last 2 years)
4. Positive tuberculin skin test

Bacteriology, histology and chest radiography are considered as reference diagnostic criteria against which the usefulness of the above criteria have been evaluated. These criteria have been described in detail below to guide the practicing family physician in exercising high index of suspicion among such cases and subsequently diagnose and treat TB among children effectively.

1. Failure to thrive and Non-specific symptomology

Symptoms of TB in children depend upon the site involved. Specific symptoms related to an extra-pulmonary site often render quick diagnosis possible. For example: in situations where central nervous system is involved, the symptoms like altered sensorium, headache, vomiting, convulsion and fever are predominant and the diagnosis would be almost obvious. In this context, it is pertinent to mention that early diagnosis and prompt treatment of TB meningitis is very important from the prognostic point of view, since the sequelae following late diagnosis like adhesions and fibrosis may lead to mechanical defects causing hydrocephalus, irrespective of the robustness of the regimen administered.

In a majority of the conditions where primary complex is encountered, the symptoms are often vague and non-specific. Cough which is a cardinal symptom of pulmonary TB in an adult setting is often infrequent and not a predominant symptom in childhood TB. Sometimes, cough and localized wheeze may often be reported due to the pressure

of an enlarged hilar or carinal lymph node on the bronchus. Parents often report complaints like the child not gaining weight or losing weight, lack of appetite, often falling sick (recurrent respiratory infection), irritable, not playful like other children and delay in recovering from the minor infections. All the above symptoms are termed as "failure to thrive" in paediatric parlance. This should lead necessarily to high index of suspicion of a primary complex or progressive primary complex in a child. In majority of cases (95%), primary complex heal uneventfully. In the remaining cases, TB is expressed as disseminated or pulmonary disease. The component of hilar adenopathy may just be an incidental finding in the evolution of an uneventful primary complex. This may be (unwittingly!) diagnosed as a TB case by an over-cautious treating physician reinforced by anxiety of the parents.

History of prolonged and continuous fever along with the above symptoms may also be reported among children suffering from primary complex. It is relevant to mention here that among children with unexplained prolonged fever, the possibility of recurrent urinary tract infections, enteric fever and malaria also should be kept in view as differential diagnostic possibilities and investigated accordingly.

Symptoms like wheeze, enlarged cervical lymph node, prolonged fever, night sweats, persistent cough and listlessness have been found in different study groups to be present in 0-40% of paediatric TB cases and are thus poor predictors of disease^{5, 6}. However, the symptoms assume higher significance in elderly children especially among those with cavitary disease which may occur in less than 5% of cases.

2. Under-nutrition

An association between nutritional status of the children and development of TB disease has been observed among both bacteriologically and radiologically confirmed cases, but more so among the former^{5, 6}. In a study carried out by NTI, 40-60% of paediatric TB cases - bacteriologically or radiologically confirmed, were found to be suffering from under-nutrition when assessed by

Quetlet's index [(weight in kg ÷ height in cms square) x 100]⁶. Under-nutrition has been found to be better predictor of the disease than symptoms and has been observed among 45-62% of bacteriologically or radiologically confirmed cases⁶.

3. History of contact with a known case of pulmonary tuberculosis.

High index of suspicion of a child suffering from TB arrived on the basis of complaints like failure to thrive /established under-nutrition, should lead to a detailed and careful elicitation of history of contact with a known case of pulmonary TB in the household. It is not advisable to use technical language in eliciting such a history from parents / attendant. History should be centred around any member of the households being subjected for sputum or X-ray examination for continuous cough of more than two weeks or consumption of drugs/ administration of injections over a period of few months. Review of records of investigations and treatment undertaken by households if available may be of immense value for confirming the the history of contact. Such history in an under-nourished child reinforces towards diagnosis of TB. This is especially so with reference to contact with smear positive pulmonary tuberculosis compared to radiologically positive or culture positive cases⁵.

As a predictor of the disease, history of contact assumes greater significance if the subject is exposed to a bacillary case within last two years, since children with recent infection (in last two years) are 7 times more likely to progress to disease than those who were remotely infected⁷. Household contacts are more important than other contacts. In these days of nuclear families where servant maid forms part of the family, elicitation of the history of TB among them may be of significance. In a study conducted by NTI, history of contact with a known case of pulmonary TB was found among 62% of bacteriologically confirmed paediatric cases and in 2% of the radiologically diagnosed cases⁶. Hence the possibility of a false positive diagnosis based only on radiological evidence should be kept in view.

4. Tuberculin skin test

The test is one of the aids in the diagnosis of TB among children, unlike in an adult setting where the prevalence of the infection is high. In this context, administration of a standard tuberculin test with 1TU/2TU of PPD RT23 with Tween 80, in eliciting the most specific type of reaction cannot be over emphasized. Care should be taken to measure only induration and not erythema within 48-72 hrs. For the purpose of screening for TB disease, a maximum transverse diameter of induration equal to or more than 10 mm (irrespective of the BCG vaccination status) may be considered as positive. While interpreting tuberculin reactions, the possibility of suppression of cell-mediated immunity as a result of under-nutrition or viral infection in the recent past should be kept in view. Under-nutrition still remains a predictor of the disease in the absence of positive tuberculin reaction. It is prudent not to repeat a tuberculin test with higher concentrations of tuberculin. Test may be repeated with the same dose, if the procedure of administration was improper e.g. given subcutaneously instead of intra-cutaneously. The repeat test should preferably be given within a week and not later than 2nd week, to avoid false positive reactions attributable to booster phenomena⁸. A positive tuberculin reaction in a suspected case of TB with history of contact and under-nutrition has found to be a reliable predictor of disease among children. In a study conducted by NTI, 65% of the bacteriological cases and 62% of the radiological cases had reaction size more than 10mm⁶.

Conclusion

Early and prompt diagnosis of TB is often difficult in a childhood setting. High index of suspicion is a pre-requisite, especially when symptoms are vague and non-specific. High index of suspicion should be followed by careful elicitation of detailed history of contact with a case of pulmonary TB. Assessment of nutritional status and tuberculin test further strengthen the process of diagnosis. Ultimately, specific diagnostic investigations like chest X-ray, sputum/ gastric lavage examination

or other investigations may confirm the diagnosis.

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