TUBERCULOSIS IN CHILDREN - A SOCIAL & SCIENTIFIC CHALLENGE

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INTRODUCTION

Though more than a century has elapsed, since the discovery of mycobacterium tuberculosis by Robert Koch the diagnosis of tuberculosis in children often eludes even the best of clinicians. The disease in children remains very insidious in the early stages, with rapid progression to more malignant forms, often taking the clinician unaware. Hence, a high index of suspicion especially in a tropical country will go a long way in getting at this dreaded killer in the early stage.

MAGNITUDE OF THE PROBLEM

It is estimated that about 8 million Indians are suffering from tuberculosis, out of which 1,50,000 are infectious.

The prevalence of tuberculous infection, as judged by tuberculin reaction is in the range of 16-20% in children less than 15 years. The prevalence of disease is 2.7% and the annual incidence of infection is 1.9%.

This high prevalence of tuberculosis, is reflected in hospital admissions, where according to Udani et al 10-15% of admissions are for various types of tuberculosis.

In Vani Vilas Children's Hospital, Bangalore, 4.2% of total admissions between 1971-73 were due to tuberculosis. This hospital admission is only the apex of the pyramid, the base of which is in the community.

Narmada et al from Madras reported a mortality of 60/100,000 in the age group of 0-12 years. Raj Narain et al during 1975 have shown a mortality rate of 5.2 - 5.5/10,000 and has quoted a higher mortality figure for urban population when compared with rural population.

The cause of the high prevalence of tuberculosis in childhood is multifactorial; the most important being mal-nutrition, which is seen in more than 60% of the pre-school children. Measles, whooping cough and other intercurrent illnesses act as predisposing factors in this age group. These factors disturb the immunity of the child making him more susceptible than an adult.

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The diagnostic criteria of tuberculosis applicable in an adult, do not hold good in children. For example, applying adult diagnostic procedures such as detection of Acid Fast Bacilli (AFB) in sputum and X-ray positivity can prove to be deceptive in childhood tuberculosis. In an extensive clinical and autopsy study conducted by Udani et al, it was shown that as many as 37% of autopsies of proved miliary tuberculosis, were X-ray negative. As high as 90% of primary complexes (autopsy proved) did not show up on the X-ray, and 40% of proved fibrocaceous tuberculosis were missed antemortem. In 17% of cases, in a study by Udani et al the diagnosis of tuberculosis meningitis could not be established even with the best available clinical and laboratory facilities.

It is the clinician, with a sharp clinical acumen who can detect tuberculosis early. A positive contact history and a mantoux test properly done and scrupulously interpreted will go a long way in diagnosing tuberculosis. Tuberculin test is still the most effective and reliable tool in the diagnosis of childhood tuberculosis. A reaction of 10 mm or more, to 1 TU RT 23 intradermally injected PPD after 48-72 hours is a definite indication of infection although mal-nutrition being rampant in our children reduces tuberculin sensitivity significantly due to depressed cell mediated immunity. Even well nourished immunocompetent children may not show tuberculin sensitivity, as evidenced by a study in USA, where 4.5% who had bacteriologically proven disease, were tuberculin negative.

In infants and children aged 0-2 years, a positive reaction of more than 15 mm induration, indicates a recent infection and these children must be kept under close observation or actively treated. In children, 2-5 years of age, a positive test alone should no longer be regarded as an indication of active disease. But, if a positive reaction is associated with unexplained pyrexia or nutritional disturbances then clinical tuberculosis must be considered.

A positive tuberculin reaction beyond the age of 5 years only indicates that infection has occurred sometime or the other in the past. A negative tuberculin test indicates absence of infection especially in an area of low prevalence and incidence of disease.

It is not out of place to mention that Mantoux Test could be negative even in a small percentage (5%) of sputum positive patients and in a large percentage (15-20%) of X-ray positive sputum negative tuberculous patients. But, no attempt should be made to correlate the size of the tuberculin reaction with the extent of the disease. The tuberculin test, as a method of case-finding is mainly applicable to areas where the infection rates are low and BCG is not used extensively.

**BCG TEST**

The accelerated response to BCG has been claimed to be of superior value in the diagnosis of tuberculosis. But, it suffers several drawbacks.
It contains large quantities of bacillary proteins and also other constituents like polysaccharides, lipids and waxy substances. These are all capable of enhancing reactions at the local site. The exaggerated response may be misinterpreted as due to infection with mycobacterium tuberculosis.

CHEST X-RAY

The small parenchymal lesions of the lung may not be visible on the X-ray in a majority of instances. To detect these, tomograms may help. Unfortunately these are available only in a sophisticated set-up. Chest X-ray should be ideally taken in the mid expiratory phase to delineate minute parenchymal lesions. Another drawback is the wide variation in the interpretation of the films. This is adequately illustrated by the study conducted by Narmada et al.

ISOLATION OF ACID FAST BACILLI

The isolation of AFB in sputum is impracticable in children, as most children swallow the sputum. This has led to the use of gastric lavage method, wherein the stomach content is aspirated early morning and examined for AFB. This early morning sample is devoid of contaminants and is shown to be positive in as many as 32% of cases of tuberculosis (study conducted at Vani Vilas Children's Hospital, Bangalore). Other methods of isolation of bacilli are laryngeal swab examination, bronchial aspirate and lung aspirates, pleural and parietoneal fluid examination.

Regarding TBM, the diagnosis may elude the clinician in the early stages by masquerading as enteric fever, bronchopneumonia etc. These atypical manifestations must always be kept in mind.

Regarding CSF changes in TBM, the typical changes may not be seen in tuberculous encephalopathy. Another clinical problem is in distinguishing TBM from a pyogenic meningitis (inadequately treated). In such instances, the CSF changes are almost identical and cause difficulty in diagnosis.

Here, more sophisticated investigation like ClEP and Radio active bromide partition test come to the aid of the physician.

Other tests like estimation of LDH activity immunoglobulins and Magnesium level in CSF help us in tricky situations.

Lymphoblastoid transformation of patients lymphocytes in tissue culture in presence of PPD, fluorescent staining, demonstration of cellular products of bacilli, indirect immunofluorescent test, ELISA are being tried to use as adjuvant for early and correct diagnosis. But, these are still in experimental stages. It requires further evaluation and these tests cannot at present be applied for mass application in rural population.
THERAPEUTIC PROBLEMS

Before the advent of chemotherapeutic drugs, the essentials of treatment of tuberculosis were good food and fresh air, aimed at increasing the resistance of the patient, so that he could combat the organisms on his own.

With the discovery of potent anti TB drugs, our main aim is to eliminate the organism from the host first. The patient’s immune response is given a less significance than before. Chemotherapy, if used early and effectively guarantees a total cure of the disease, thus protecting the individual and the community. The chemotherapeutic drugs can be classified as primary and secondary line of drugs. The primary drugs include SM, INH, Rifampicin and Ethambutol. The secondary agents like Pyrazinamide, Thioacetazone, Cycloserine etc., are not routinely used in pediatrics.

Of these, INH and Rifampicin are bactericidal. Fortunately, for the paediatrician, the emergence of drug resistance is not a problem and the toxic reactions of the drugs, seen in adults are not that common in children. This is amply proved by the recent study conducted at Vani Vilas Children's Hospital, wherein it was observed that the organisms retained sensitivity to standard anti TB drugs. The problems of management are many in the far advanced stage of the disease like in TBM where mortality and morbidity are very high, inspite of anti TB drugs. Irregular treatment or early discontinuation of therapy, lack of follow-up are common causes of treatment failure in children.

Control of tuberculosis poses a great challenge to the public health authorities of a developing country. Apart from the problem of case-finding and chemotherapy, the social problems involved entail considerable difficulties in its management. Poverty, ignorance, social stigma and taboos attached to the disease affect community participation to a considerable extent. Role of health education, imparting sound simple knowledge about tuberculosis to the public in general through well designed posters, radio and TV is bound to change the attitude of the community towards a tuberculous patient.

Lack of efficient social/voluntary organisations to persuade people to take treatment are also responsible for lack of tuberculosis education of the communities.

Overcrowding in cities, increasing industrialisation indiscriminate spitting and constant immigration of people from one place to another further add to the problem of control and management. According to the WHO, control of tuberculosis means reduction of tuberculosis to a low level of < 1%, prevalence of natural (specific) reactors to standard tuberculin among children in the less than 14 years age group.

Though BCG vaccination has failed to control the occurrence of fresh cases, it can definitely reduce the disseminated type of tuberculosis in children.
In conclusion, it could be summarised that the control of tuberculosis essentially depends on the following principles:

1. Early detection of cases
2. Effective chemotherapy
3. Chemoprophylaxis - selectively used
4. BCG vaccination to susceptibles (below 1 year)
5. Continuous surveillance in tuberculosis

Improving the nutritional status of children and better coverage under the EPI programme (including measles vaccine) will heighten their immunological status, in order to combat this menacing problem.

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