

PULMONARY CAVITATORY TUBERCULOSIS IN CHILDREN

D. Vijayasekaran
P. Selvakumar
A. Balachandran
J. Elizabeth
L. Subramanyam
N. Somu

ABSTRACT

This study was undertaken to analyse children with pulmonary cavitatory tuberculosis which is a rare and infectious condition. The pretreatment characteristics, course and response to three different anti-tuberculous regimes in 27 children with cavitary pulmonary lesions registered at the TB Clinic, Institute of Child Health, are described. Male:Female ratio was 1.2:4. Thirty per cent of affected children were below 3 years of age and had predominant lower lobe involvement whereas in older children the upper lobes were affected. Eighty five per cent of children had definite history of contact with an adult with tuberculosis. Tuberculin test was positive in 70% of children. Cavitary lesions were observed in the right lung in 66% of cases. Follow up and surveillance was carried out in 23 children who completed the anti tuberculous treatment. Regimes with isoniazid, rifampicin, pyrazinamide and streptomycin were given to different groups. Response and compliance was also monitored. Eleven out of 23 children had persistence of radiological lesions even after completion of 9 months of therapy. Inclusion of streptomycin with 2 or 3 bactericidal drugs in the intensive phase showed a better response.

Key words: Tuberculosis, Tuberculous cavity, Chemotherapy.

Pulmonary tuberculosis in children presenting as cavity is a problem because it acts as a source of infection (which is responsible for the persistence of the disease in the community) and is often non-responsive to therapy. Although tuberculous cavitary lesions are no longer seen in countries of low prevalence, they are still seen in areas of high prevalence like India due to infection with resistant bacilli. Studies have revealed that in adults each cavity harbors 10^7 - 10^9 tuberculous organisms. This is a perpetual threat to the patient as it may re-open at anytime. Inclusion of streptomycin helps in the clearance of such lesions(1). Because of its rarity, we are presenting a report of 27 children with cavitary tuberculosis seen in our Tuberculosis Clinic, Institute of Child Health over the past 4 years. The pre-treatment characteristics, course and response to three anti-tuberculous regimes are discussed.

Material and Methods

Between January 1989 and February 1993, 27 children with tuberculosis who showed pulmonary cavitary lesions seen at the Institute of Child Health and registered at the Tuberculosis Clinic were recruited for the study. After a detailed history and physical examination, investigations like complete blood count, Mantoux (1 tuberculin unit of purified protein derivative RT 23 with tween 80), chest skiagram, culture and

From the Department of Pediatric Respiratory Diseases, Institute of Child Health, Egmore, Madras 600 008.

Reprint requests: Dr. N. Somu, Additional Professor of Pediatric Respiratory Diseases, F-49, 1st Main Road, Anna Nagar, Madras 600 012 (T.N.)

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smear of resting gastric juice and sputum for acid fast bacilli (AFB) and liver function tests were done. Chest skiagram, liver function tests and complete blood counts were repeated once every 3 months. The children were assigned to three groups. Group A = 2SHRZ/10 HR; Group B=2SHR/10HR; and Group C=2HRZ/10HR. Cases from Madras city were placed in Groups A and B alternately whereas children from outside the city (who could not be given injection streptomycin under supervision) were given the regimen containing oral drugs (Group C) and followed up once in every fifteen days. Of 27 children, 23 had completed while 4 are still on treatment; the 23 children who completed treatment and followed up for atleast 6 months were analyzed for response to therapy. Response to therapy was judged by clinical improvement and radiological clearing.

Results

Female children were more commonly affected and the male to female ratio was 1.2:4. In female children, cavitory lesions occurred in all age group whereas no male child was seen in the age group of 4-9 years (*Table I*).

BCG scar was present in 40% of cases and a definite history of contact with a known case of adult tuberculosis was present in 88%. Seventy per cent of children were tuberculin positive (*Table I*).

The clinical features are depicted in *Table II*. Fasting (resting) gastric juice (RGJ) analysis was done once in all the 23 children before initiation of therapy. Of 8 children in the age group of 3 months to 6 years, culture and smear were positive in one child each. Of 15 children in the age group of 7-12 years, the RGJ analysis showed smear positivity in 3 and culture positivity

in 2 cases. Sputum analysis for acid fast bacilli done in older children showed smear positivity in one case and culture positivity in 2 cases.

Cavitatory lesion occurred more commonly (66%) in the right lung. The site of the lesions is depicted in *Table III*.

Of 23 children who had completed treat-

TABLE I—Characteristics of Children with Tuberculous Cavity in Relation to Sex

Characteristics	Sex		Total (27)
	M (8)	F (19)	
Age (yrs)			
3 mo - 3	2	6	8
4-6	-	1	1
7-9	-	5	5
10-12	6	7	13
BCG scar	5 (62.5)	6 (31.5)	11
Mantoux +ve	5(62.5)	14 (73.7)	19
Contact with TB	6 (75.0)	18 (94.8)	24

Figures in parantheses indicate column percentages.

TABLE II—Symptom Analysis of Children with Tuberculous Cavity

Symptom	No. (27)	%
Loss of appetite	21	77
Chronic cough	17	63
Failure to thrive	15	55
Fever	10	37
Chest Pain	5	18
Blood tinged sputum	2	7

TABLE III—Site of Lesion of Tuberculous Cavity in Relation to Age and Sex

Age group (yrs)	Sex (n=23)	R (15)		L (8)	
		U*	L**	U	L
3 mo - 6	M (2)	-	1	-	1
	F (6)	1	1	2	2
7-12	M (4)	2	1	1	-
	F (11)	8	1	-	2
		11	4	3	5

*U - Upper lobe, ** L - Lower lobe.

ment, 14 (60%) were regular and 9 (40%) were irregular. Among the defaulters, 7 out of 9 cases happened to be female children. Ten of 14 children on regular treatment showed complete radiologic resolution compared to 2/9 on irregular treatment. Thus a total of 12/23 children showed radiological clearing. Among the 3 groups, A (2SHRZ/10HR) and B (2SHR/10HR) showed better clinical and radiological response. In Group A, 5 out of 5 and in Group B, 5 out of 6 showed complete radiological clearance. Group C (2HRZ/10HR) showed poor response with only 2 out of 12 cases showing radiological clearance.

Of 11 cases with persistent radiological lesions on completion of treatment, 6 cases had persistent cavitory lesions and 5 cases had developed bronchiectasis.

Discussion

Tuberculosis Clinic at the Institute of Child Health, Madras, registers nearly 1000 new children with pulmonary tuberculosis annually. Even though cavitory tuberculosis is rare among children, on an average 6 cases were seen every year. In children, cavitory lesions may arise by one of the

following mechanisms: (a) acute cavitation from extension of a recent primary focus and evacuation of the contents, (b) evacuation of the caseous material from a slowly growing round focus, (c) rapid lung destruction following bronchial spread and (d) exogenous reinfection following hematogenous spread. Cavitation arising out of exogenous reinfection and progression of the primary lesion are more common in populations with increased prevalence of tuberculosis, like in India(2,3).

In this study, female children were more commonly affected, probably owing to the parental neglect in the form of nutritional deprivation and delayed medical care. Even after institution of treatment, irregular drug therapy was observed more in females. This resulted in non-responsiveness to therapy and persistence of cavitory lesions in female children even after complete treatment. Sixty six per cent of cavitory lesions occurred in older children in the age group of 7-12 years whereas 30% occurred in children below 3 years of age. This is because frequency of post primary disease increases at and during puberty(4). Lower lobe involvement was observed more often in children below 3 years. This may be possibly due to the enlargement of the primary focus as these children were malnourished. As in adults, upper lobe involvement was observed in older children. High partial pressure of oxygen in these zones (as a result of a high ventilation perfusion ratio) and impaired lymphatic drainage favours the growth of tubercle bacilli. Eighty eight per cent of children had contact with an adult with tuberculosis indicating a high correlation of cavity formation in children with adult contacts. It was observed that most of these adult contacts were on irregular therapy. Seven of the 11 children with persistent

radiological lesions at the end of therapy had close contacts with irregularly treated open cases of adult tuberculosis in the family.

Eleven of the 23 children who completed the treatment regimen had persistence of radiological lesions. Twenty eight per cent of cases taking regular treatment and 77% of cases taking irregular therapy did not respond. Several studies report that the persistence of radiological lesions may be attributed to infection with resistant or atypical mycobacteria. In our study the possible reasons for the failure of treatment are irregular therapy and close contact with irregularly treated open cases of adult tuberculosis.

Regimes 2SHRZ/10HR and 2SHR/10HR were more effective because 90.9% of the children showed radiological clearance in these groups. This clearly shows that inclusion of streptomycin along with 2 to 3 bactericidal drugs in the intensive phase gives an excellent response. This is because streptomycin diffuses readily into the extracellular compartment of most body tissues and it attains bactericidal concentration in tuberculous cavities(6). Non compliance is the most significant problem regarding the treatment of tuberculosis(7) and, compliance is better when an injection is introduced in the treatment schedule.

The importance of cavity formation in tuberculosis lies in the communication it provides for the organisms with the outside environment. It results in a continuous supply of well oxygenated air to the interior of the cavity that stimulates rapid extracellular bacterial multiplication and provides a means for spread of disease both to other part of the lung and to other individuals(5). Therefore, children with cavitary lesions require constant surveillance and sufficient nutritional support. If reactivation occurs,

antituberculous therapy has to be restarted after complete re-evaluation.

Thus we conclude that: (a) tubercular-cavitary lesions, though rare, do occur in children when they live in close contact with irregularly treated or open cases of adult tuberculosis, and (b) regimes containing streptomycin with 2 or 3 bactericidal drugs in the intensive phase give a better response in the management of tuberculous cavity. Clinical trials with more cases is required for confirmation of these observations.

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