CHILDHOOD TUBERCULOSIS IN A REFERRAL CENTRE: CLINICAL PROFILE AND RISK FACTORS

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ABSTRACT

One hundred and ninety six children (age group 6 months to 12 years) attending the Pediatric Tuberculosis Clinic at AIIMS, New Delhi, over a period from January 1988 to December 1989 were analysed. Nearly 61% of children were malnourished (Grades III and IV). A positive family history was noted in nearly one third (33.7%) of cases while 41.3% of children had received BCG. A positive Mantoux test was noted in 77% of cases. The most prominent lesion on radiology was parenchymal (51.4%). In nearly two third of cases, both Mantoux test and X-ray chest was positive. A family history of tuberculosis and BCG vaccination was significantly associated with positive Mantoux test ($p<0.01$). Fever and cough in older children (>6 years) while weight loss in younger children (<3 years) were the predominant symptoms. Most of the cases (82.1%) had pulmonary primary complex, the proportion being higher in older age group. The severe form of tuberculosis, i.e., progressive primary disease, miliary tuberculosis, etc., were significantly more in younger children. The various risk factors significantly associated with severe form of tuberculosis were very young children (<3 years), no BCG vaccination, a negative family history and a negative Mantoux test.

Key words: *Childhood pulmonary tuberculosis, Clinical profile, Risk factors.*

Inspite of the introduction of effective chemotherapy of tuberculosis for the last three decades, tuberculosis still contributes to significant morbidity and mortality in the pediatric age group(1,2). Though the point of control in tuberculosis, defined by WHO(2) as Mantoux positivity of less than 10% among children in the age group 0-12 years, has not been achieved by any country, the prevalence, incidence and death rates have fallen appreciably in the developed countries. The prevalence of disease in India is estimated to be between 2 to 7% and annual incidence about 1.9%(1). However, many more cases are either not detected (thus a potential source of infection to children) or diagnosed very late, thus contributing to the increased mortality. It could be because of lack of adequate epidemiological data(1). Thus, the present study was designed to see the effect and relationship of tubercular infection with positive family history, BCG vaccination, Mantoux positivity, symptomatology including the risk factors of pulmonary tuberculosis without extrapulmonary involvement in the age group 6 months to 12 years.

Material and Methods

The children with pulmonary tuberculosis and those with symptoms suggestive of tuberculosis with positive Mantoux test but no pulmonary lesions on X-ray film of

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the chest in the age group of 6 months to 12 years, were selected from the Pediatric Tuberculosis Clinic at AIIMS, New Delhi, over a period from January 1988 to December 1989. The diagnosis of pulmonary tuberculosis was made as per the criteria by Seth(1). The Mantoux test was considered positive with an induration of 10 mm or more with 1 TU of purified protein derivative (*PPD*-RT 23) read after 48-72 hours. The details of these children, *i.e.*, age, sex, nutritional status, family history of tuberculosis, BCG vaccination, Mantoux positivity, symptomatology, *i.e.*, fever, cough, *etc.* and the type of pulmonary tuberculosis were recorded on a pretested proforma. The nutritional status of these children was studied as per the criteria of nutrition subcommittee of the Indian Academy of Pediatrics(3).

Results

A total of 196 children were found to have pulmonary tuberculosis. More than half (61.2%) of the children were severely malnourished (*Table I*). The age-wise distribution of children in respect to positive family history, BCG vaccination, Mantoux positivity and positive chest roentgenogram is shown in *Table I*. Of Mantoux positive children, 69 (35.2%) had an induration of more than 20 mm. *X*-ray lesions included parenchymal (51.4%), parenchymal alongwith adenopathy (16.9%), and only adenopathy (31.7%). Among them, both hilar and paratracheal lesions were present in 45%, hilar alone in 47.6%, and in 7.4% paratracheal alone. 2.5, 3.3, 1.1 and 1.5% children had parenchymal lesions with effusions, miliary shadows, adenopathy with effusion and effusion alone, respectively.

Both Mantoux and *X*-ray chest were positive in 138 cases (70%). In 45 children (23%), a positive *X*-ray chest was associated with a negative Mantoux test. While only a positive Mantoux test (*X*-ray chest normal) was found in 13 cases (6.6%).

TABLE I–*Distribution of Children According to Age*

Age groups (yrs)	No. of children	Malnutrition	Positive family history	BCG given	Positive Mantoux test	Positive *X*-ray chest
<3	28 (100)	21 (75)	13 (46.2)	11 (39.3)	16 (57.1)	20 (71.4)
3-6	72 (100)	42 (58.3)	27 (37.5)	34 (47.2)	54 (75)	70 (97.2)
7-12	96 (100)	57 (59.4)	26 (27.1)	36 (37.5)	81 (84.4)	93 (96.9)
Total	196 (100)	120 (61.2)	66 (33.7)	81 (41.3)	151 (77.0)	183 (93.4)
p value		<0.05	NS	NS	<0.05	NS

Figures in parentheses indicate percentages; NS = Not significant.

A family history of tuberculosis and BCG vaccination was significantly associated with positive Mantoux test (*Table II*). Fever and cough were the predominant manifestations in older children (especially those of more than 6 years) and weight loss (>10% of pre-illness weight) in younger children (<3 years) (*Table III*).

TABLE II—*Relationship of Family History of Tuberculosis and History of BCG Vaccination with Mantoux Positivity.*

Variables of family history and history of BCG vaccination	Total No. of children n=196 (%)		No. of children with positive Mantoux test (%)		p value
Family history					
Yes	66	(33.7)	59	(89.4)	<0.01
No	130	(66.3)	92	(70.8)	
BCG					
Yes	81	(41.3)	73	(90.1)	<0.01
No	115	(58.7)	78	(67.8)	

TABLE III—*Age-wise Distribution of Symptomatology in Children with Tuberculosis*

Symptoms	Total No. of children (n=196)	Age groups (yrs)			p value
		<3 (n=28)	3-6 (n=72)	7-12 (n=96)	
Fever	129* (65.8)	8 (28.6)	32 (44.4)	89 (92.7)	<0.001
Cough	125 (63.8)	5 (17.9)	26 (36.1)	94 (97.9)	<0.001
Weight loss	74 (37.8)	15 (53.6)	34 (47.2)	25 (26.0)	<0.05
Anorexia	70 (35.7)	12 (42.9)	31 (43.1)	27 (28.1)	NS
Diarrhea	21 (10.7)	5 (17.9)	6 (8.3)	10 (10.4)	NS
Vomiting	17 (8.7)	2 (7.1)	5 (6.9)	10 (10.4)	NS

* Figures for various symptoms are not mutually exclusive.
NS = not significant. Figures in parentheses indicate percentages.

In older children (especially those of more than 3 years), most of the cases of pulmonary tuberculosis belonged to that of pulmonary primary complex and symptomatic Mantoux positive groups (*Table IV*).

Various risk factors, highly associated with severe form of tuberculosis, included very young children (age less than 3 years), no BCG vaccination, a negative family history of tuberculosis and a negative Mantoux test (*Table V*).

Discussion

It is a common belief that tuberculosis is more prevalent in malnourished children. In a previous publication from the same institute(4), a large proportion of tuberculous children (61.2%) were found to be malnourished, about 30% being of severe degree. Majority of children in this series had tuberculous meningitis. Aderele(5) reported malnutrition in 67% of tuberculous children with 11% being of severe variety.

The present study revealed a positive Mantoux test in the majority (77%) of children with pulmonary form which is comparable to the Aderele series(5) as well as to that of Freiman in black children(6). On the contrary, the reported positivity of Mantoux test by other Indian workers(7-11) is much lower (ranging from 35-60%). It could be due to inclusion of all types of tuberculous children in these reports while we included predominantly the children with pulmonary tuberculosis.

TABLE IV—*Age-wise Distribution of Children in Various Types of Pulmonary Tuberculosis and Symptomatic Mantoux Positive Groups*

Type of tuberculosis (N=196)	Total No. of children	Age groups (yrs)						p value
		<3 (n=28)		3-6 (n=72)		7-12 (n=96)		
Pulmonary primary complex	161 (82.1)	16 (57.1)		61 (84.7)		84 (87.5)		<0.05
Progressive primary disease*	11 (5.6)	5 (17.9)		2 (2.8)		4 (4.2)		
Miliary	8 (4.1)	3 (10.7)	8 (28.6)	3 (4.2)	7 (9.8)	2 (7.3)	7 (12.5)	<0.05
Pleural effusion	3 (1.6)	--		2 (2.8)		1 (1.0)		
Symptomatic Mantoux positive	13 (6.6)	4 (14.3)		4 (5.6)		5 (5.2)		<0.05

* Includes consolidation alone, collapse alone, collapse with consolidation etc. and cavitary adult type.

Figures in parentheses are percentages.

TABLE V– *Risk Factors for Severe forms of Tuberculosis in Children.*

Risk factors	Milder form (%)*		Severe form (%)**		p value
(*i*) Age group (yrs)					
<3 (n=28)	20	(71.4)	8	(28.6)	<0.05
>3-12 (n=168)	154	(91.7)	14	(8.3)	
(*ii*) BCG vaccination					
Yes (n=81)	77	(95.1)	4	(4.9)	<0.05
No (n=115)	97	(84.3)	18	(15.7)	
(*iii*) Family history					
Positive (n=66)	64	(97)	2	(3.0)	<0.05
Negative (n=130)	110	(84.6)	20	(15.4)	
(*iv*) Tuberculin positive					
Yes (n = 151)	146	(96.7)	5	(3.3)	<0.001
No (n=45)	28	(62.2)	17	(37.8)	

* Includes pulmonary primary complex and symptomatic mantoux positive

** Includes progressive primary disease, military tuberculosis, pleural effusion and cavitary adult type variety.

The information about chest roentgenogram findings, in pulmonary tuberculosis in Indian literature is scarce(1). In the present series, more than 90% of children demonstrated some sort of lesion suggestive of tuberculosis on the *X*-ray chest; the commonest being parenchymal lesion, followed by hilar lymphadenopathy, *etc.* It is in accordance with that of other workers(5-12).

Family history of tuberculosis was found in 1/3rd of cases which is comparable to other workers from African countries(5,6). With a positive family history, the younger children of the family are said to be more vulnerable to contract infection(1). However, in our series, both younger (<6 years) as well as older (>6 years) children were affected in almost comparable proportions.

Tuberculosis can occur in BCG vaccinated children(13). The contention is further substantiated by our observations where more than one third cases of pulmonary tuberculosis received BCG vaccination which is higher compared to other series(1,5,6). Further, children of all age groups were more or less equally vulnerable to contract infection inspite of BCG vaccination.

Mantoux positivity may be an indicator of tuberculosis in children of all age groups(1). However, in our patients, we noted a significantly higher prevalence of tuberculin positivity in older children (especially those of more than 6 years age). It could be because of young children usually presenting with severe form of tuberculosis (*Table IV*) which may suppress the cell mediated response to Mantoux test. Thus, in younger children with suspected tubercular infection, a negative Mantoux test may rather indicate severe form of pulmonary tuberculosis

which needs a more careful evaluation.

The study exhibited a significant relationship of positive family history and Mantoux positivity. Children with milder form of tuberculosis had more often positive family history as compared to ones with severe form (*Table IV*). Hence, a child with severe form of tuberculosis having negative family history needs exhaustive investigations.

In BCG vaccinated children, the maximum waning (75%) of delayed hypersensitivity occurs by the age of three years. The extent of induration and tuberculin positivity in the tuberculous children have been reported to be independent of the prior BCG vaccination(1). However, in our results the Mantoux positivity rate was significantly higher in tuberculous children with BCG vaccination compared to those without vaccination. It could be because of BCG vaccinated children usually developing a milder form of tubercular infection (*Table V*) where the cell mediated response is usually intact, while non-BCG vaccinated children usually manifest with a severe form which is expected to have no specific cell mediated immunity against tuberculosis.

In accordance to reported literature(1,5), the most common symptoms of pulmonary tuberculosis noted in the present study were fever, cough, weight loss and failure to thrive. Fever and cough were the predominant symptoms in older children while weight loss in younger children.

Majority of the children in our study belonged to the symptomatic primary complex group. However, other workers from India(1,9,14) have reported primary complex in lesser proportion. It could be due to selection of the sample. Most of those studies were from the hospital admissions while our study was limited to outdoor patients only. Our results are comparable with the results of study conducted by Aderele(5) in Nigeria on children from the Pediatric Tuberculosis Clinic.

Children below three years of age suffered from severe illness probably because of non-communicability of the symptoms in the younger age group which may cause undue delay in the diagnosis thus helping in development of a severe disease.

Negative family history was associated with increased severity of pulmonary tuberculosis; most likely explanation is less awareness expected in families with no family history of tuberculosis which would delay the consultation thus promoting the progression to a severe form.

BCG vaccination was protective against severe form of tuberculosis. Mantoux test was negative in severe illness because of impaired cell mediated response in such patients(1). It is concluded that more studies should be centered around pulmonary primary complex, particularly for diagnosis and trial of short course chemotherapy regimens.

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NOTES AND NEWS

GROUP ON CHILDHOOD DISABILITY

A group on Childhood Disability has been formed under the aeges of the IAP. This is a multidisciplinary group which will be working for the welfare of disabled children of the country. The aim of this group is to collect information from all over the world regarding their prevalence, management and rehabilitation of these children. Educating the parents will also be one of the aims of this group.

Membership fees:

1. Ordinary Member	Rs. 100/-	per year *or*
	Rs. 1000/-	life membership
2. Associate Member (for non-pediatricians)	Rs. 50/-	per year *or*
	Rs 500/-	life membership

Members interested in the total welfare of disabled children are requested to apply for the membership of this group to:

Dr. S.D. Singh,
Professor and Head,
Department of Pediatrics,
11, Film Colony, Indore.