

Original Articles

CHILDHOOD RESPIRATORY TUBERCULOSIS IN IRAN

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ABSTRACT

To estimate the bacterio-epidemiological situation of childhood respiratory tuberculosis in Iran, 2185 symptomatic patients of 0-14 years old were studied. Among 110 bacteriologically confirmed cases, 60% were less than five years old and the number of females was slightly more than males. In 21% of patients, the Mantoux test was negative. None of the miliary cases had a history of BCG vaccination. In 54.6% of patients less than two years old, one of the family members was suffering from infectious tuberculosis. Clinical findings were fever, cough, weight loss and respiratory distress respectively. Radiological findings were mostly pneumonia or bronchopneumonia-like infiltrations and in 44% of cases were found in the right lung. *Mycobacterium tuberculosis* strains in 11.7% of patients were resistant to isoniazid or streptomycin.

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INTRODUCTION

Although introduction of modern anti-tuberculous agents, better understanding of pathogenesis and immunology of the disease and improvement of socio-economic situation have led to a decline in the incidence of tuberculosis in developed countries, it is still regarded a major world health problem, especially in the developing countries. It has been estimated that in developing countries 10 million persons each year develop tuberculosis, with 4-5 million highly infectious cases of smear positive tuberculosis and at least three million die from the disease. Cost in terms of human suffering, disability and socio-economic loss is immeasurable. In any campaign against the disease, childhood tuberculosis should not be overlooked, since primary infection usually occurs in the lung and early in life, especially in developing countries.^{1,2}

Although primary infection is usually self-limiting,

but under close observation in a well-nourished population in England, one-third of 99 children under five years of age showed recognizable illness at the time or immediately after primary tuberculous infection.³ If the incidence of intercurrent infection is greater and the standard of nutrition lower, the incidence of symptoms might be much greater.

Primary tuberculous infection may sometimes progress to pulmonary tuberculosis indistinguishable from that of young adults. One hundred twenty nine children aged 7-15 years old from a total of 1200 studied in a children's hospital for tuberculosis from 1948 to 1960 had adult type disease.³ In a small proportion of those infected, hematogenous spread of bacilli may occur and lead to meningitis or miliary tuberculosis which are severe and progressive, and before introduction of chemotherapy, were often fatal. This gives the study of childhood tuberculosis a special significance and importance.

Childhood Respiratory Tuberculosis

MATERIAL AND METHODS

In order to estimate the bacterio-epidemiologic situation of childhood tuberculosis in Iran, 2158 patients with pulmonary symptoms 0-14 years old were clinically, radiologically and bacteriologically examined from March, 1983 to March, 1985. Patients were tuberculin-tested and their sputum or gastric washing samples (1-3 times) examined by direct fluorescence microscopy and culture for detection of acid-fast bacilli. Strains of mycobacteria isolated from patients were identified according to the results of growth rate, catalase, niacin, nitrate reduction, TCH (Thiophen-2-carboxylic acid hydrazide) sensitivity and other tests. The drug sensitivity pattern of the strains were determined by proportion method.^{4,5}

RESULTS AND DISCUSSION

Infectious agent: Diagnosis of tuberculosis in children usually is based on clinical pictures and the tuberculin test, because discharge of tubercle bacilli is much less prevalent in children than adults. However detection of tubercle bacilli is the only way to prove a case as tuberculous; and for this purpose sputum, gastric contents or laryngeal swabs can be examined. Among 2158 symptomatic patients studied, 110 cases were confirmed tuberculous by bacteriological examinations. The result of direct microscopy was positive in 21% of cases and among 94 isolates for which different tests for identification were carried out, the infectious agent was found to be *Mycobacterium tuberculosis*. This indicates that although bovine tuberculosis is an important problem in the country, pasteurization or boiling of milk and proper health inspection of slaughter houses has reduced its transmission.

Drug-sensitivity tests were performed on 94 strains of tubercle bacilli and the results indicated that 11.7% of strains were resistant to one drug (isoniazid or streptomycin). Multiple drug-resistance was not observed. Data on drug-resistance of the parents of cases suffering from drug-resistant strains were not available, so comparison between strains isolated from parents and children was not possible. However primary drug-resistance is more prevalent in children than adults.^{6,7,8}

Age: More than 63% of patients were less than five and 43% less than three years of age. Figure 1 shows the age distribution pattern in patients and those suffering from miliary tuberculosis.

Figure 1 indicates that in Iran, primary infection mostly occurs in early childhood, the most vulnerable age group in which development of infection to disease is very high.

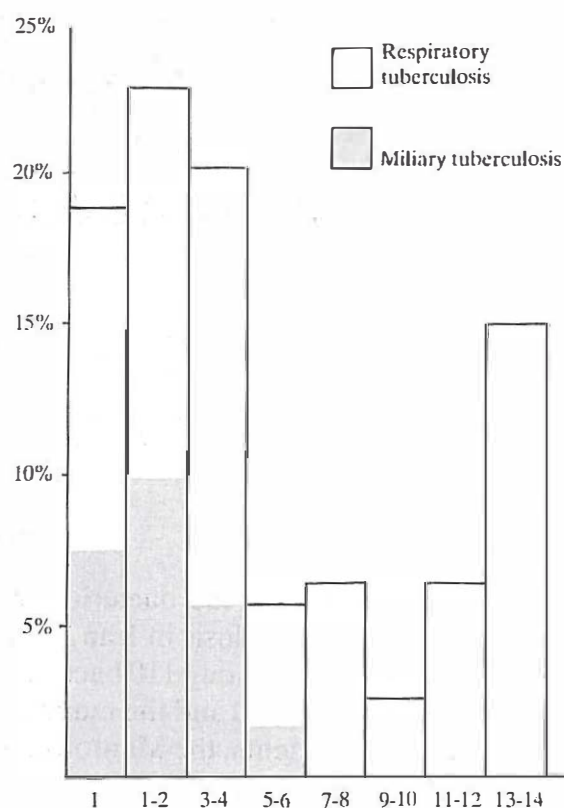


Figure 1: Frequency distribution of age in childhood tuberculosis, 1983-1985, Iran.

Sex: The number of female sufferers was slightly more than males, but the difference was not statistically significant, although studies in Iran have shown that tuberculosis is more prevalent among women.⁶ The same feature has been observed in South India, while other studies indicate that the incidence rate in males and females is the same from childhood through young adult life and then incidence rate for males becomes higher than females.⁹

Tuberculin reaction: Tuberculin reactions were positive in 79.3% of patients and among those who did not react to tuberculin 63% were suffering from miliary tuberculosis and 73% were less than three years old. While different studies show 4-36% tuberculin reaction less than 10mm in confirmed adult type pulmonary tuberculosis,¹⁰⁻¹³ the rate is much higher in childhood tuberculosis, especially when the patients are not smear positive or the diagnosis is based on clinical picture and chest X-rays. In tuberculous children, rates of 20-50% negative tuberculin reaction have been reported.¹⁴ However neither a positive tuberculin reaction indicates that the present illness is due to tuberculosis nor does a negative reaction exclude tuberculous infection, especially in malnourished, very

Table I: Clinical findings in childhood respiratory tuberculosis, 1983-1985, Iran.

Clinical findings Age groups	Fever	Cough	Weight loss	Respiratory distress	Diarrhea & malabsorption
	< 1 year	15	16	5	8
1-2	22	14	9	3	5
3-4	19	18	8	3	2
5-6	4	2	2	2	-
7-8	5	4	3	1	-
9-10	1	2	-	-	-
11-12	4	5	4	-	-
13-14	8	13	5	-	-

ill, immunosuppressed children or those in the convalescence period of intercurrent infection. Tuberculin-negative reaction in a tuberculous child usually converts to positive by continuation of treatment and disappearance of immunosuppression.

History of BCG vaccination: None of the military cases had a history of BCG vaccination. BCG if administered to new-born or young infants, confers considerable protection against tuberculosis.¹⁵ It also reduces the risk of serious disseminated lesions such as meningitis or miliary tuberculosis,¹⁶ and even when these complications occur the illness will not be severe.

Household contact: One of the family members, usually the mother (54.6% of cases less than two years of age) was suffering from infectious tuberculosis. Sometimes isolation of tubercle bacilli from mother led to detec-

tion of disease in child. Studies indicate that 39-65% of household contacts of smear-positive patients aged up to 14 years were tuberculin-positive.¹⁷ Infection in these subjects more often develops into disease, which make early case-finding and effective chemotherapy of infectious cases very important.

Activating factors: In 4.5% of patients the disease appeared after measles infection and in 6.3% of cases, tuberculosis was superimposed on malnourished children, indicating the importance of activating factors.

Clinical findings: The most prevalent clinical findings were fever, cough, weight loss and respiratory distress, respectively. Table I shows frequency distribution of clinical findings.

In early infancy, respiratory distress was more prevalent but cough was less prevalent. Occasionally fever was the only reason for attendance. Spina ventosa accompanied only one case.

Radiological findings: Radiological findings may include enlarged mediastinal lymph nodes, primary complex, segmental lesions, miliary pattern, or cavity of pleural effusion. Often there is a dissociation between pulmonary shadows and children's physical conditions, so that extensive shadows may be found in a child who is not seriously ill. Table II shows the results of chest X-rays.

Radiological findings in 44% of patients were found in the right lung and 15% in the left, but bilateral X-ray shadows were seen in 34% of patients.

Table II: Radiological findings in childhood respiratory tuberculosis, 1983-1985, Iran.

Radiological findings Age groups	Miliary pattern	Infiltration			Lymphadenopathy			Cavity		Pleural effusion	
	Bilateral	Right lung	Left lung	Bilateral	Right lung	Left lung	Bilateral	Right lung	Left lung	Right	Left
< 1 year	8	6	3	5	-	-	-	-	-	-	1
1-2	12	6	1	5	4	-	3	1	-	1	1
3-4	6	11	-	5	5	-	1	-	-	1	-
5-6	1	2	-	1	1	-	1	-	-	-	-
7-8	-	3	-	1	1	-	-	-	-	-	1
9-10	-	-	1	-	-	-	-	-	-	-	-
11-12	-	3	2	-	2	1	1	-	1	-	1
13-14	-	6	3	2	-	-	-	3	2	1	-

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REFERENCES

1. Tuberculosis Control. Report of Joint IUAT/WHO Study Group. *Tubercle* 63:157-169, 1982.
2. Tuberculosis Control. Pan American Health Organization, 29-30, 1986.
3. Miller F J W: Tuberculosis in Children. London, Churchill Livingstone, 105-136, 1982.
4. Kubica GP, David HL: The Mycobacteria. In: Sonnenwirth AC, Jarett L: *Gradwohl's Clinical Laboratory Methods and Diagnosis*. 8th ed, London, C.V. Mosby Company, 1694-1730, 1980.
5. Canetti G, et al: Laboratory methods for testing drug sensitivity and resistance. *Who Bull* 29:565-578, 1983.
6. Mohammadi M: Epidemiology of tuberculosis. In: Velayati AA: *Tuberculosis*. 1st ed, Tehran, University Center for Publication, 80-105, 1988.
7. Steiner P, et al: Primary drug-resistance in children. *Am Rev Respir Dis* 110:98-100, 1974.
8. Steiner P, et al: Primary drug-resistant tuberculosis in children. *Am J Dis Child* 139:780-782, 1985.
9. Comstock GW: Epidemiology of tuberculosis. *Am Rev Respir Dis* 125:8-15, 1982.
10. WHO Tuberculosis Research Office: Further studies of geographic variation in naturally acquired tuberculin sensitivity. *WHO Bull* 22: 63-83, 1955.
11. Aziz S, Haq G: The Mantoux reaction in pulmonary tuberculosis. *Tubercle* 66: 133-136, 1985.
12. Patterson DH: Mantoux test in eastern Nepal. *Tubercle* 63: 237-238, 1982.
13. Kardjito T, Grange JM: Immunological and clinical features of smear-positive pulmonary tuberculosis in East Java. *Tubercle* 61: 231-238, 1980.
14. Udani PM: Evaluation of tuberculin test in practice in pediatrics. *Ind Ped* 19: 469-485, 1982.
15. Ten Dam HG, Hitz KL: Does BCG vaccination protect the newborn and young infants? *WHO Bull* 58: 37-41, 1980.
16. Lindgren I: The pathology of tuberculous infection in BCG vaccinated humans. *Advances Tuber Res* 14: 202-234, 1965.
17. Rouillon A, et al: Transmission of tubercle bacilli; the effect of chemotherapy. *Tubercle* 57: 275-299, 1976.