Original article

The pattern of childhood tuberculosis at the Ethio Swedish-Children's Hospital

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Abstract: Tuberculosis (TB) still remains a major public health problem in the developing world. Ninety five percent of the cases and 99% of deaths due to TB occur in the developing countries. TB is one of the major health problems in Ethiopia. The objective of the study is to outline the pattern of TB among Ethiopian children. Three hundred and seventy five children fulfilling the clinical criteria for TB were enrolled in the study at the ESCH, Addis Ababa, over a period of one year, from May 1993 to April 1994. Their ages ranged from one month to 14 years. The M:F ratio was 1.03:1 . Most children were from families with low socio-economic status, who lived in a one or two-roomed houses. More than five people live in a house in about 80% of the families. Symptom complex of TB and compatible X-ray were the two commonest findings followed by positive Mantoux test. Sputum examination for acid fast bacilli was done in 37 patients and was positive in 27% of them. Opacity was the commonest chest X-ray finding followed by infiltrations and hilar/paratracheal lymphadenopathy. There were nine patients with cavitary tuberculosis. Cervical lymph nodes were mostly affected (55.5%) followed by axillary nodes (24.0%). Thoracic vertebrae were common sites for spondylitis. Forty four and half percent had pulmonary TB, 27.5% had extra pulmonary TB, and 28% of the patients had two or more systems involved. Forty four percent of the patients were lost to follow up and 52.3% of the patients completed their treatment. Only three had signs of drug toxicity and one had treatment failure. Thirteen patients (3.5%) died at the hospital. The study showed that the lung is the most commonly affected organ, the commonest site of affection for extra pulmonary tuberculosis being the lymph nodes. Early diagnosis and close follow up are needed for better outcome in all cases of TB in children. [*Ethiop. J. Health Dev.* 1998;12(3):245-251]

Introduction

Tuberculosis(TB) still remains a major public health problem in the developing world where 95% of the cases and 99% of the deaths occur. One of these countries is Ethiopia (1).

In Ethiopia, TB has long been known as a major public health problem and is shown to be among the leading causes of hospital admission and death. In one study in the same hospital, TB accounted for 3.3% of all admissions(2).

In Ethiopia, according to the Ministry of Health Comprehensive Health Service Directory of (198687), TB was ranked as the twelveth leading cause of out patient morbidity, and third as a leading cause of hospitalization. It is the leading cause of hospital death. The overall incidence of TB in Ethiopia is estimated to range from 90,000 to 154,000 cases per year. The prevalence is estimated to fall between 180,000 and 308,000 (1).

While the diagnosis of active TB in adults is mainly bacteriologic, in children it is usually epidemiologic and indirect. The importance of an adequate history and exposure tracing cannot be overemphasized. Indirect diagnostic techniques, such as the tuberculin skin test, chest roentgenogram, and physical examination, offer supportive information.

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At present the preferred treatment of all forms of TB in children is a short course chemotherapy (SCC). The former chemo-therapy regimen, which was given for 12 or 18 months, has been replaced by "short" course, which does not exceed eight months. This regimen has been found to be more

effective than their earlier counter parts, because they consist of at least three potent antituberculosis drugs which are isoniazid, rifampicin and pyrazinamide during the first two months of treatment (1,3,4,5). The short course chemotherapy is also recommended by the WHO. It is also expected to reduce the defaulter rate.

This study attempts to determine the clinical pattern of tuberculosis among Ethiopian children.

Methods

The diagnosis of tuberculosis was made using the following criteria(6). When any two of the following are present:

1. Positive Mantoux test (PPD $\geq$ 10 mm)
2. Radiologic findings compatible with tuberculosis
3. Strong contact history
4. Symptom complex
5. Isolation of the organism by acid fast staining

OR

When any one of the following is present

1. Positive Mantoux reaction in a non-BCG vaccinated child less than four years of age.
2. Miliary pattern on chest X-ray.
3. Pathologic findings from a biopsy compatible with tuberculosis.

Those children fulfilling the above criteria were seen by one of the study physicians, either at the chest clinic or in the wards, before initiation of anti-TB treatment. A questionnaire consisting of identification, epidemiological data, complete history, and physical examination and laboratory data was filled by one of the study physicians after a thorough history and physical examination were done on each patient. The patients were started on either the short course (streptomycin, isoniazid, rifampicin, and pyrazinamide for two months followed by

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Wereda is an administrative unit, comprising of many Kebeles.

isoniazid and thiacetazone for six months or isoniazid and rifampicin for four months) or standard chemotherapy (streptomycin, isoniazid, and ethambutol for two months followed by isoniazid and ethambutol for ten to sixteen months). The assignment to either of the two regimens was done according to the area of residence of the cases. This is because the national TB Control Program and the Region 14 Health Bureau made the drugs for short course chemotherapy available for only eight selected pilot Weredas in Addis Ababa (A.A).

Patients coming from the selected Weredas were sent to their respective health institutions for daily supervised administration of their drugs during the intensive two months treatment, and then monthly follow up till the end of treatment. Those who required admission were started as in patients. Those patients coming from the rest of the Weredas in A.A and those coming from out of A.A were started on the standard chemotherapy. All patients were given appointment to the ESCH Chest Clinic and followed up until completion of treatment and, at least, once two to four months later following completion of treatment.

The EPI-Info version 6 Statistical Programme was used for analysis. Comparisons of categorical variables were analysed using the Chi-Square test.

Results

Three hundred and seventy five children were enrolled in the study from May 1993 to April 1994. Table 1 shows the age distribution which ranged from 1 month to 14 years, with the peak occurrence in the age groups 5-9 and 10-14 years. There were 190 (50.7%) males and 185 (49.3%) females. The socio-economic back-ground of the families is shown in Table 2. A large proportion were from

A.A and about two-thirds of the patients were from very low socioeconomic families. About 80% of the patients come from overcrowded housing

Table 1: **The Pattern of childhood tuberculosis at Ethio-Swedish Children's Hospital, by age and sex distribution of the patients**

Age in years	Male	Female	Total(%)
< 1	5	2	7(1.9)
1-4	58	55	113(30.1)
5-9	54	74	128(34.1)
10-14	73	54	127(33.9)
Total	190	185	375(100)

conditions with more than five persons living in one or two-roomed houses. Mothers were illiterate in the majority of the cases and children of house-wives constituted the majority of children with TB. There was a definite pattern with paternal education and occupation.

Table 2: **The pattern of childhood tuberculosis at the Ethio-Swedish Children's Hospital, by the socio econonic background of the parents**

Social background	No of cases(%)(No = 375)*
Address	
Addis Ababa	270 (72.6)
Out of Addis Ababa	102 (27.4)
Income	
≤ 250 birr/month	124 (66.6)
> 250 birr/month	62 (33.3)
House-hold size	
≤ 5 people	70 (20.2)
> 5 people	277 (79.8)
No of rooms	
1 roomed	167 (48.1)
2 roomed	104 (30.0)
3 or more	76 (21.9)
Maternal education	
illiterate	145 (54.5)
read & write	13 (4.9)
elementary- > 12 grade	108 (40.5)
Paternal education	
illiterate	97 (35.4)
read & write	25 (9.1)
elementary- > 12 grade	152 (55.5)
Maternal occupation	
housewives	201 (68.6)
Govt. employee	32 (10.9)
others	60 (20.5)
Paternal occupation	
farmer	82 (27.2)
Govt. employee	58 (19.3)
others	161 (53.4)

* Denominators vary because of missing data.

The diagnostic features of the patients are shown in Table 3. The symptom complex of TB and compatible X-ray were the two commonest findings followed by positive Mantoux test. Cough was the chief presenting symptom in 59.2%, fever in about 41%, cervical lymphadenitis in 18.4%, and 32.2% had other presenting complaints singly or in combination.

Table 3: **The pattern of childhood tuberculosis at the Ethio-Swedish Children's Hospital: Proportion of children who fulfill each diagnostic criteria in the study**

Diagnostic criteria	No of cases (%)(N = 375)*
Sx complex of TB present	349 (93.1)
Positive history of contact with a tuberculous adult or chronic cougher	179 (48.9)
Positive mantoux test (induration of ≥ 10 mm)	204 (76.4)
Compatible X-ray	298 (81.0)

* The denominators vary because of missing data

Table 4 summarizes the results of some investigations. The majority (85.5%) had an ESR of ≥ 20 mm in the first hour. Acid fast staining of the sputum was found to be positive in 10 (27.0%) of the children out of 37 who were tested. Most of the pathologic examinations done were suggestive of tuberculosis. The Mantoux skin test was positive (induration of ≥ 10 mm) in 204 (76.4%) of the children who were tested. In 34.2% of children, chest X-ray showed opacities. The other common X-ray findings are infiltrations and hilar/paratracheal lymphadenopathy. Two hundred and ten (57.4%) patients were BCG vaccinated.

The clinical signs of the patients are summarized in Table 5. About 44% of the patients had pulmonary, 35.5% lymphadenitis, 25% gastrointestinal, 12% skeletal and 12% central nervous system manifestations.

There were 167 (44.5%) children with pulmonary TB, 103 (27.5%) with extra pulmonary TB, and 105 (28.0%) patients had two systems or more involved with TB (Table 6). Out of 92 patients with disseminated tuberculosis and on whom information could be obtained, 83 (90.2%) had pulmonary involvement.

Two hundred and sixty four (70.4%) of the patients were treated as out-patient while 111 (29.6%) required admission. Table 7 shows the outcomes of the patients comparing it with

Table 4: **The pattern of childhood tuberculosis at the Ethio-swedish children's hospital: Results of common investigations done to fulfill the diagnostic crireria for tuberculosis**

Type	No of cases (%)(N=375)*
ER (mm in 1st hr.)	
<20	51(14.5)
20-40	76(21.5)
>40	226(64.0)
Total	353(100)
**AFS (sputum)	
Positive	10(27.0)
Negative	27(73.0)
Total	37(100.0)
**Biopsy.FNA.cytoloty	
Suggestive	59(95.2)
Not suggestive	3(4.8)
Total	62(100.0)
Mantoux test in mm	
0-5	43(16.1)
6-9	20(7.5)
10-15	88(33.0)
≥15	116(43.4)
Total	267(100)
** Chest X-ray suggestive	
Opacity	

Infiltration	90(34.2)
Hilar/paratracheal LN	68(25.9)
Pleural effusion	67(25.5)
Cavity	14(5.3)
Collapse/atelectasis	9(3.4)
Miliary pattern	7(2.7)
Others	5(1.9)
Total	3(1.2)
	263(100.0)

Denominators vary because of missing data **The information was obtained at a later date from 341(91%) of the cases

the mode of treatment they received. Of these patients 196 (52.3%) completed their treatment of which 48.2% were from the standard regimen group and 72.6% were from the SCC regimen group. Three patients had signs of drug toxicity, two from the standard and one from the SCC regimen group. One patient who was treated with the standard regimen had treatment failure. Thirteen (3.5%) of the patients, 12 from the standard regimen group and one from the SCC regimen group died in hospital. Of the deaths, five had disseminated TB, and seven had TB meningitis. Overall 166 (44.3%) of the patients were lost to follow up: 150 (47.9%) from the standard therapy group and 16 (25.8%) from the SCC regimen group (P= 0.0013).

Table 5: **The pattern of childhood tuberculosis at the Ethio-Swedish Children's Hospital: prevalence of major clinical signs and systems involved among 341 children with tuberculosis distributed by age**

	No of cases (%)(N = 341)* Age in months			
Clinical signs	0-11	12-59	>60	Total**
Chest	13(3.8)	46(13.5)	90(26.4)	149(43.7)
Lymphadenitis	1 (0.3)	40(11.7)	80(23.5)	21(35.5)
Gastro-intestinal	14(4.1)	37(10.9)	35(10.3)	86(25.2)
Muskulo-Skeletal	0(0)	11(3.2)	44(12.9)	55(16.1)
CNS(coma,paralysis meningeal)	0(0)	2(0.6)	10(2.9)	12(3.5)
Other systems	0(0)	0(0)	9(2.7)	9(2.7)

* The information was obtained at a later date from 341 (91%) of the cases

** Percentages do not add up to 100 because some patients had combined manifestations

Discussion

There was a slight male preponderance shown in the study, which is in agreement with another study done in Ethiopian children in 1983 (6). In the present study the peak age groups were found to be 5-9 years and 10-14 years. In the above, Ethiopian study the peak age groups were 1-4 and 59 years.

Table 6: **The pattern of childhood tuberculosis at the Ethio-Swedish Children's Hospital, by type of tuberculosis**

Type of TB	No	%
Pulmonary	167	44.5
Disseminated	105	28.0
Extra pulmonary	103	27.5
Lymph node	49	13.1
Bone & joint	34	9.1
Meningitis	8	2.1
Peritonitis	4	1.1
Pericarditis	2	0.5
other types	6	1.6

Total	No	%

About two thirds of the patients were from parents with a monthly income of less than 250 birr, who lived in overcrowded houses and more than 50% of the parents were illiterate. We did not compare the cases with other controls but it appears that most patients were from parents with low socio economic status. Most authors and researchers agree on the general association between TB and socioeconomic status, but no direct cause and
effect relationship has been demonstrated in some studies (14,15). Most of the cited literature referring to the relationship between socio-economic factors and TB were based on epidemiological observations of a simultaneous decline in TB mortality and poverty in a community. Some have reported that people with low socioeconomic status have a higher risk of being infected and a higher incidence of disease (16,17,18).

Table 7: **The pattern of childhood tuberculosis at the Ethio-Swedish Children's Hospital: final outcome of the 375 patients with the type of treatment**

Outcome	STD No(%)	SCC No(%)	Total No(%)	P-value
Alive				
Rx completed	151(48.2)	45(72.6)	196(52.3)	0.0004
Toxicity	2 (1.3)	1 (2.2)	3 (1.5)	0.4194
Rx failure	1 (0.7)	0	1 (0.5)	0.8346
Death	12 (3.8)	1 (1.6)	13(3.5)	0.3364
Lost to followup	150(47.9)	16(25.8)	166(44.3)	0.0013
Total	313(100)	62(100)	375(100)	

The diagnosis of TB in children usually rests on a series of facts: clinical and radiological signs, the existence of close or recent contact with a source of infection, and the results of tuberculin test (3). So it continues to be surrounded by considerable uncertainty. The now well known interaction among TB, HIV infection, and AIDS and the difficulty of distinguishing the features of AIDS and its complications from those of childhood TB complicates further this diagnostic process (7). Symptom complex of TB and compatible X-ray were the two commonest findings which were in agreement with other studies(6).

About 86% had ESR of $\geq$ 20 mm in the first hour which was also shown to be 76% in the previous study done in Ethiopian children with TB (6). Microbial confirmation of tuberculosis may be difficult in young infants with primary infection because infants may not cough, and sputum, when produced, is usually promptly swallowed (10). Acid fast staining of the sputum was done on 37 patients and was positive in 10 of them. In our study 88 (33%) of the patients had induration of 1015 mm after Mantoux skin test (using 2 units) and 116 (43.4%) > 15 mm.

Our result showed that 210 (57.4%) of the patients are BCG vaccinated. The tuberculin conversion rate after BCG immunization was found to be 59% in Ethiopian children (12). However BCG cross reaction usually produces less than 10 mm of induration (3,10,13), and the degree of positivity due to BCG is strongest within the first few years after immunization. Thus we consider that, especially for those more than three years of age and who are immunized, the 10-15 mm induration is due to infection rather than due to the BCG immunization (10,12).

From those patients with superficial lymphadenitis, the cervical node was the most commonly involved group 55/121 (45.5%), which is in agreement with others (6). There were 27 patients with spondylitis in our study. The thoracic vertebrae were the most commonly involved sites for 14(51.9%) of the patients followed by lumbar, thoraco-lumbar, and cervical, which is in agreement

with other studies (6). The hip was the most involved site of arthritis, (7or most 77.8%) followed by the knee joint, which is similar to other studies (6). Pulmonary TB alone constituted 167 (44.5%) of the cases. Other studies showed that pulmonary TB alone constituted 60.6% and 82.7%, respectively (6,8). TB adenitis and bone TB were the most common extra pulmonary forms which were found to be the same in other studies (6,9,10).

Many children with tuberculosis can be adequately managed as outpatients (10). In our study, most of the patients could be initiated on treatment as outpatients. The admission rate was 29.6%. In our study 13 patients died, a mortality rate of 3.5%. One had pulmonary TB, five had disseminated TB, and seven had TB meningitis. Mortality is related to the type and severity of the disease. In the third stage of TB meningitis, the mortality rate is about 50% (10). One hundred and sixty six(44.3%) of the patients were lost to follow up in our study. Other studies reported that 40% to 65% of TB cases are lost to follow up (6,8). Default rates in many centers are high. It increases as the duration of treatment increases. According to Aderele (11) from Ibadan, Nigeria, the default rates after 6, 12, 18, and 24 months were 30%, 39%, 55%, and 71%, respectively. Hylander (8) reported a default rate of 65% from the tuberculosis center of Addis Ababa, and this seemed largely to consist of patients who disappeared after their first visit. Reasons given for defaulting are: clinical improvement of patient, distance from health institution, and other social problems.

The rate of defaulter is low in those cases treated with SCC compared with that of standard therapy. This was statistically significant.There was no statistically significant difference in the rate of toxicity, treatment failure, and mortality between the two treatment groups. These may be explained by the small number of cases in the SCC group.

The study showed that in the diagnosis of childhood TB, radiologic examinations and Mantoux skin test are very good indicators together with a good history. We recommend that Mantoux test be available in pediatric clinics and hospitals. Sputum examinations were done in only 37 patients since small children usually do not produce sputum. Gastric aspirates should be done in infants and young children in whom sputum cannot be obtained. Parents and care takers should be informed of the importance of taking the drugs regularly. All patients who are initiated on anti TB treatment need a regular follow up and should be traced if they miss their appointments. The new strategy of WHO for the global control of TB-DOTS (Directly Observed Therapy Short-Course) will help reduce the defaulter rate and minimize the development of drug resistance. This is because in DOTS, every patient is observed while taking each drug for TB treatment and it is suggested that this strategy must be used in all national TB control programmmes.

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