

Tanaffos (2006) 5(1), 59- 63

©2006 NRITLD, National Research Institute of Tuberculosis and Lung Disease, Iran

## Prevalence of Tuberculosis in Close Contacts Smear Positive TB Patients

Soheila Khalilzadeh <sup>1, 2</sup>, Heydar Masjedi <sup>1</sup>, Mohammad Reza Boloursaz <sup>1</sup>, Soheila Zahirifard <sup>3</sup>, and Ali Akbar Velayati <sup>1</sup>

<sup>1</sup> Department of Pediatrics, <sup>2</sup> Mycobacteriology Research Center, <sup>3</sup> Department of Radiology, NRITLD, Shaheed Beheshti University of Medical Sciences and Health Services, TEHRAN-IRAN.

### ABSTRACT

**Background:** Tuberculosis (TB) is considered as one of the main causes of mortality and morbidity in developing countries. At present, extensive contact investigation among households is not a routine part of TB control efforts in most countries. The investigation of contacts of TB cases is an essential part of TB control program. In this study, we have evaluated the active contact tracing among close contacts of smear positive TB patients. The main aim of this research was to demonstrate the prevalence of TB and to fully screen the close contacts of TB patients in order to detect active and infected TB cases.

**Materials and Methods:** Close contacts of newly diagnosed smear positive pulmonary TB patients were identified. The information and data of the contacts including history, clinical examination, history of BCG vaccination, results of tuberculin skin test (TST), and bacteriological and radiological manifestations were collected on special questionnaires.

**Result:** Out of the total 147 close contacts of 34 index cases, 81 (55.1 %) were female and 66 (44.9%) were male. Based on the nationality, there were 38 (25.9%) Afghan refugees and 109 (74.1 %) Iranian cases. The duration of contact was as follows: in 30 cases the contact time period was less than 1 yr., in 75 individuals it was more than 1 yr., while 42 individuals had a persistent contact. In 61.8% of the cases the induration of TST was less than 15 mm, while in 38.2% it was more than 15 mm. Abnormal radiological manifestations were detected in 33.3% of close contacts including calcification (25.17%), parenchymal infiltration (4.08%), cavity (2.04%) and nodular lesions (2.04%). According to the diagnostic findings, out of 147 contacts, 7 (4.8%) cases of pulmonary TB were detected.

**Conclusion:** In our study no significant statistical difference was found regarding the prevalence of TB among the Iranian and Afghan close contacts. Also there was no significant statistical difference in the duration of contact time of the TB cases. Furthermore, positive radiological findings were detected in 33.3% of the close contacts. In 25.7% of the cases, the pattern was calcification indicating primary TB infection. According to the results of this research the rate of TB in contacts is 400 times higher than the society (4800/100,000 versus 12/100,000).

This study points out the importance of systematic investigation of contacts to discover new cases of TB. It also demonstrates the significant role of radiology as a major tool in diagnosing both TB infection and disease. (Tanaffos 2006; 5(1): 59-63)

**Key words:** Tuberculosis, Close contact, Radiological manifestation, Smear positive TB

Correspondence to: Khalilzadeh S

Address: NRITLD, Shaheed Bahonar Ave, Darabad, TEHRAN

19569, P.O:19575/154, IRAN

Email address: skhalilzadeh@nritld.ac.ir

## INTRODUCTION

Tuberculosis (TB) is one of the major causes of preventable death in the third world countries. Despite the 100% effectiveness of chemotherapy in TB, it is still uncontrollable due to "diagnosis delay" observed in some of the cases (1). One of the principal methods of timely diagnosis is by effective follow-up of close contacts. The chance of acquiring TB by close contacts of these patients depends on the type of contact, duration of contact, the level of contagiousness and the virulence of the microorganisms. The risk of acquiring TB is highest during the initial 48 months after the first contact, decreasing subsequently (2, 3). According to various researches performed in case of contacts of active TB patients, results showed that in 41 % of close contacts there is a risk of infection. Out of this figure 6% develop TB before it is diagnosed. By giving chemoprophylaxis to these individuals, TB infection and disease could be prevented (4). In a recent study carried out in Cameron, rate of TB in close contacts was 14.6% (5). Also it was seen that in Malawi, 64 % of children living with a smear positive patient, developed active disease (6). One of the most important methods by which active TB infection and disease could be detected is by screening household contacts (7). In a research conducted in the United States in the year 2000, results showed that for each case of active TB, six close contacts were identified. Also, it was observed that 36% of close contacts had positive tuberculin test (8). A 7-year-long investigation on close contacts in India showed that the incidence of "new TB cases" for the first year of contact was 64%. These rates for the initial 3 years and afterwards were 22% and 13% respectively (9). According to the results of this research, close-contacts of smear positive patients were evaluated in regard to TB infection and disease. They had either received chemoprophylaxis or anti-TB treatment. The main aims of this research were evaluating

various TB screening methods and detecting "new TB cases" in close contacts of TB patients.

## MATERIALS AND METHODS

This prospective study was conducted on 147 close contacts of 34 smear positive TB patients in National Research Institute of Tuberculosis and Lung Disease from March 2002 to December 2003.

Close contacts were defined as individuals living in the same house with a TB patient for a period of 30 days.

The age range of contacts under study was 1-70 year. The necessary information and data of each close contact such as: history, clinical examination, history of contact with TB patients, record of any BCG vaccination, bacteriologic and radiological findings were recorded in special questionnaire forms. The PPD test was performed on the anterior surface of forearm by injecting 0.1 cc of 5 I.U tuberculin solutions. The result of this test was read after 48-72 hrs by measuring diameter of induration.

The diagnostic criteria of TB in adults are: presence of clinical symptoms and/or radiological features along with two positive smear tests and/or one positive smear and one positive culture for M. TB.

Meanwhile, the diagnostic criteria for detecting TB in children include 3 out of 5 of the following points:

- 1- Presence of clinical symptoms
- 2- History of close contact with a TB patient
- 3- Positive radiological findings
- 4- Positive tuberculin test
- 5- Presence of positive bacteriologic or pathological findings in favour of TB

Out of total 147 close contacts understudy, 81 (55.1 %) were female and 66 (44.9%) were male. Also according to their nationality 38 (25.9%) were Afghan and 109 (74.1 %) were Iranian.

The age of the patients ranged from 1 yr to 70 yr. with an average of 23 years. From the "family relation" point of view the close contacts were: father (21 cases), mother (16 cases), spouse (9 cases), children (16 cases) and other family members (85 cases).

Regarding the "duration of contact" 3 forms were detected:

1) Contact duration of less than one year that was periodical: 30 cases

2) Contact duration of more than 1 year which was periodical: 75 cases

3) Continuous and persistent contact: 42 cases

With respect to past history of BCG vaccination: 86.4% had positive scar while 13.6% did not have any BCG scar showing the absence of BCG vaccination. The diameter of PPD induration is shown in Table 1.

**Table 1.** PPD Induration Diameter

PPD induration (mm)	Percent (%)
0-5	2.9%
6-9.9	23.5%
10-14.9	35.4%
>15	38.2%

As it is demonstrated in Table 1, 61.8% had a PPD induration of less than 15 mm, while in 38.2% the diameter was more than 15 mm. Out of the total 147 close contacts studied, 7 had pulmonary TB while the rest of the group i.e. 140 contacts were normal.

Out of 7 pulmonary TB patients, 5 (71.4%) were Iranian and remaining 2 patients (28.6%) were Afghan. Table 2 shows the age of patients.

**Table 2.** Age of TB Patients

Age	Number of Patients
0-15 yr.	1
15-30 yr.	2
30-45 yr.	3
> 50	1

Also in 4 cases the duration of contact was more than one year while in 3 patients this period was less than one year (p value= 0.59).

Table 3 shows the radiological findings in both the close contacts and TB patients.

**Table 3.** Radiological manifestation in close contacts and pulmonary TB patients

X-ray finding	Contacts	P.T.B cases
Cavitation	3 (2.04%)	3
Infiltration	6 (4.08%)	3
Calcification	37 (25.17%)	1
Nodule	3 (2.04%)	2
Normal CXR	98 (66.67%)	

## DISCUSSION

As it is seen in this study the rate of TB in close contacts of TB patients is 4.8% which is higher than that of developed countries. In a research conducted in England, the reported rate of TB in 723 contacts was 0.9%. Meanwhile these rates in Australia and Japan were 0.51% and 0.6% respectively (10).

Studies carried out in Cameron and Malawi showed that the TB contact rates were 14.6% and 64% respectively (5, 6).

It should be emphasized that detection of TB in close contacts depends not only on the prevalence of TB in the country but also on the available screening methods (3, 11). Nowadays, several methods of screening are used in order to detect TB. As seen in this research in addition to various bacteriological methods used for detection of TB, role of radiology as a major tool in diagnosing TB and infection is demonstrated.

In our study, the highest prevalence of TB was seen at the age range of 15-45 years which was similar to other studies. Out of 147 individuals studied, 32 children in contact were screened. In this group, there was a six-year-old child who suffered

from negative smear pulmonary TB while having radiological manifestations of adenopathy and right lung infiltration for which treatment was offered. Also, 16 children below five years of age received chemoprophylaxis.

It should be noted that the cavitory form of pulmonary TB is uncommon in children, with the smear negative TB being more common than the smear positive type in this age group (12, 13).

In our study, we also reached to this point that there was no significant relation between the duration of contact and TB incidence. As it is clear, out of 7 cases, three have contact duration of less than one year while in 4 patients this period is of more than one year.

In this research, 33.3% of household contacts had positive radiological manifestations. Among these manifestations, calcification was observed in 25.7%, showing primary TB infection in these individuals. After being infected with M.TB the primary lung complex consisting of parenchymal involvement and lymphadenopathy, is formed (14, 15).

During the following 6-12 months, the primary TB lesion is calcified. These calcified lesion point towards the fact that active TB was not diagnosed on-time. This delayed diagnosis would lead to primary TB infection and radiological manifestations of calcification in contacts of TB patients.

Out of 147 cases under study, 7 suffered from pulmonary TB. Their CXR showed pulmonary infiltration along with cavitations, pointing towards active TB.

The presence of 25.7% calcified granuloma in household contacts indicates active TB. In this study, the importances of TB screening in close contacts of smear positive TB patients as well as the valuable diagnostic role of radiology in early diagnosis of TB are emphasized and highlighted.

## CONCLUSION

The present study showed the significance of active case detection and follow-up in close contacts of smear positive TB patients. This aim should be considered seriously at the national level by which transmission and spread of TB could be stopped.

## REFERENCES

1. Corbett EL, Watt CJ, Walker N, Maher D, Williams BG, Raviglione MC, et al. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Arch Intern Med* 2003; 163 (9): 1009- 21.
2. Reichler MR, Reves R, Bur S, Thompson V, Mangura BT, Ford J, et al. Contact Investigation Study Group. Evaluation of investigations conducted to detect and prevent transmission of tuberculosis. *JAMA* 2002; 287 (8): 991- 5.
3. Reichler M R, Taylor Z, Castro Kg. Factors in tuberculosis contact investigations [letter]. *JAMA* 2002; 297-4.
4. Vidal R, Miravittles M, Cayla JA, Torrella M, de Gracia J, Morell F. Increased risk of tuberculosis transmission in families with microepidemics. *Eur Respir J* 1997; 10 (6): 1327- 31.
5. Kuaban C, Koulla-Shiro S, Lekama Assiene T, Hagbe P. [Tuberculosis screening of patient contacts in 1993 and 1994 in Yaounde, Cameroon]. *Med Trop (Mars)* 1996; 56 (2): 156- 8.
6. Topley JM, Maher D, Mbewe LN. Transmission of tuberculosis to contacts of sputum positive adults in Malawi. *Arch Dis Child* 1996; 74 (2): 140- 3.
7. World Health Organization Communicable Diseases. Global Tuberculosis control. WHO Report 2000. Geneva, Switzerland: WHO, 2000.
8. Marks SM, Taylor Z, Qualls NL, Shrestha-Kuwahara RJ, Wilce MA, Nguyen CH. Outcomes of contact investigations of infectious tuberculosis patients. *Am J Respir Crit Care Med* 2000; 162 (6): 2033- 8.
9. Krishna Murthy VV, Nair SS, Gothi GD, Chakraborty AK. Incidence of tuberculosis among newly infected population and in relation to the duration of infected status. *Indian J TB* 1976; 23: 3-7.

10. Ansari S, Thomas S, Campbell IA, Furness L, Evans MR. Refined tuberculosis contact tracing in a low incidence area. *Respir Med* 1998; 92 (9): 1127- 31.
11. Noertjojo K, Tam CM, Chan SL, Chan-Yeung MM. Extra-pulmonary and pulmonary tuberculosis in Hong Kong. *Int J Tuberc Lung Dis* 2002; 6 (10): 879- 86.
12. Gessner BD, Weiss NS, Nolan CM. Risk factors for pediatric tuberculosis infection and disease after household exposure to adult index cases in Alaska. *J Pediatr* 1998; 132 (3 Pt 1): 509- 13.
13. Kumar S. DOTS in pediatric tuberculosis. *Indian Pediatr* 2006; 43 (3): 275- 6.
14. Selekmán J. Changes in the screening for tuberculosis in children. *Pediatr Nurs* 2006; 32 (1): 73- 5.
15. G/mariam A. A two year retrospective review of reasons for pediatric admission to Chiro Hospital, Eastern Ethiopia. *Ethiop Med J* 2005; 43 (4): 241- 9.

Archive of SID