

PULMONARY TUBERCULOSIS IN HOUSEHOLD CONTACT OF PATIENTS WITH ACTIVE TUBERCULOSIS IN AHWAZ, IRAN (2003-2005)

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ABSTRACT

Objectives: To determine the prevalence of tuberculosis (TB) among the household contacts.

Methodology: It is a retrospective descriptive study conducted in Ahwaz a city in the southwest of Iran, between October and February 2007. Medical files and epidemiological forms of documented TB cases and their contacts in Ahwaz Health Center over the three years period from 2003 to 2005 were reviewed. An index case (IC) was defined as the first TB case identified in the household. A household contact (HC) was defined as an individual who had resided in the household for at least thirty days prior to the diagnosis of tuberculosis in the index case. Secondary cases were defined as TB cases among contacts of the IC.

Results: We found 69 patients as IC of TB. Secondary TB in HC and community contacts (CC) was 64 and 15 cases respectively. The studied contact population of 1293 individuals included 352 HC and 941 CC. The prevalence rate of TB for HC and CC was 18.2% and 1.5% respectively ($p < 0.05$). The prevalence rate of TB from IC with smear positive pulmonary tuberculosis (SPPTB) and smear negative pulmonary tuberculosis (SNPTB) for HC and CC was 23.1%, 11.7% and 2.3%, 0.8% respectively ($p < 0.05$). More than 95% of patients with TB in HC were middle aged or elderly. HIV seropositivity and history of IDU addiction was detected in 18.7% of HC with tuberculosis ($p < 0.05$).

Conclusions: Tuberculosis is common among household contacts of index cases in Ahwaz (Iran), especially among middle aged and elderly, HIV-infected and IDU addict contacts.

KEY WORDS: Tuberculosis, Contact, Prevalence rate, Ahwaz.

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INTRODUCTION

Tuberculosis (TB) remains a serious threat to public health in developing countries like Iran, especially in high prevalent area such as Khuzestan.¹ The study of household contacts (HC) of infectious tuberculosis cases has contributed substantially to our current understanding of occurrence of tuberculosis and its transmission.² Previous studies of HC have established that TB cases are most infectious when acid-fast bacilli (AFB) are present in sputum.^{1,3-6} Young children, within families with

smear positive pulmonary tuberculosis (SPPTB) patients were at great risk for developing tuberculosis.⁷⁻⁹ Proper treatment of TB is an effective way in limiting further infection or disease in the household.^{1,4}

Household studies are an effective way to estimate the efficacy of Bacillus Calmette-Guérin (BCG) vaccination^{7,10} and chemoprophylaxis of TB infection.¹⁰ Since the emergence of the human immunodeficiency virus (HIV) pandemic, various studies from different countries of HC have assessed the effect of HIV on transmission of *Mycobacterium tuberculosis* and developing TB with variable results.^{6,10} Underlying diseases such as HIV infection, injecting drug usage (IDU), bronchial asthma under treatment systemic corticosteroid, malignancies and malnutrition increase the risk for active tuberculosis,¹⁰ yet except for HIV disease these conditions do not account for the burden of TB worldwide.¹¹ Environmental characteristics such as crowding and social factors, including poverty and imprisonment, are associated with increased risk of tuberculosis.^{4,5,9-15}

The present study was performed to evaluate the effect of host and environmental factors on the risk of TB in Iranian households. The aim of this study was to find out the prevalence of TB among the household contact and compare them with community contact (CC) of those with tuberculosis who are registered at the TB unit of Ahvaz health center.

METHODOLOGY

This retrospective study based on existing data was carried out in Ahvaz city in south west Iran. Between October and February 2007, medical files and epidemiological forms of tuberculosis cases and their household contacts during three years period from 2003 to 2005 were reviewed. We found index cases (IC) by tracing registered TB patients. Index cases were asked to address their contacts in the community (out of the house) such as school, college, office and other working places. By re-study of the TB files in Health Center we found secondary TB cases and extracted related data.

The study recruited pulmonary tuberculosis cases that had one or more household/community contacts living with them. Cases have been identified according the Iranian National Tuberculosis Program (INTP) using directly observed treatment short course (DOTS) strategy in TB unit at Health Center and Razi Hospital in Ahvaz, Iran.¹⁶ The study was approved by research deputy board of Medical College affiliated to Ahvaz Jundishapur University of Medical Sciences. A household was defined as a group of people living within one residence who share meals together. An IC was defined as the first tuberculosis case identified in the household.

A household contact was defined as an individual who had resided in the household for at least 30 days prior to the diagnosis of tuberculosis in the index case.¹ Community contact was defined as an individual who had contact with index case outside the house. Secondary cases were defined as tuberculosis cases among household/community contacts of the index case. Tuberculosis was classified as smear positive pulmonary tuberculosis (SPPTB) and smear negative pulmonary tuberculosis (SNPTB). A tuberculin skin test (TST) was considered positive if it was 10mm or greater.^{10,16} Patients were considered HIV seropositive if HIV-ELISA and western blot was positive.^{10, 16} Children aged five years or less and HIV-seropositive adults (with TST = or >5mm) without active tuberculosis that has been treated a 6-month course of isoniazid (INH) were recorded.¹⁶ Data of characteristics of the index case, household/community contact, BCG vaccination status, received INH chemoprophylaxis, co morbidities such as HIV positivity and environment were analyzed in SPSS, 11.5 software by using chi-square test and Fisher's exact test. Differences with $P < 0.05$ were considered statistically significant.

RESULTS

We found 69 patients as IC of tuberculosis. Secondary TB in household and community contacts was 64 and 15 cases respectively. The studied contact population of 1293 individu-

Table-I: Prevalence rate of pulmonary tuberculosis among contacts by bacteriological status of index case

Index case	Household			Community			OP rate(%)	P value
	Contact population	No of cases	Prevalence rate (%)	Contact population	No of cases	Prevalence rate (%)		
AFB+	185	46	24.8	498	11	2.2	8.3	
AFB-	167	18	10.8	443	4	0.9	3.6	<0.0001
Total	352	64	18.1*	941	15	1.6*	6.1	<0.0001

OP rate; overall prevalence rate, AFB; Acid fast bacilli, * Statistically significant between household and community contact, $p < 0.05$. Statistically significant association between bacteriological status of index cases and type of contact population, $p < 0.05$.

als included 352 HC and 941 CC from 69 IC (index case). The over all prevalence rate of secondary TB for HC and CC was 18.2% and 1.5% with statistically significant differences ($p < 0.05$).

The prevalence rate of secondary TB from index case with SPPTB and SNPTB for household and community contact was 23.1%, 11.7% and 2.3% , 0.8% respectively, with statistically significant differences ($p < 0.05$). The overall prevalence rate and also the prevalence rates of the disease in the two contact groups were higher among the contacts having a sputum

positive source than those having a sputum negative source (Table-I). Prevalence rate of latent tuberculosis (tuberculin reactivity) and active tuberculosis according to age and gender are shown in (Table-II). Risk factors for transmission and developing disease and efficacy of preventive measures are shown in Table-III. Increasing trend in age was associated with increased risk of TB in both the contact groups with significant differences ($p < 0.05$). The prevalence rate of the disease in male and female was not significantly different ($p > 0.05$). HIV infection and IDU addiction

Table-II: Age and sex specific prevalence rate of tuberculin skin test positivity and pulmonary tuberculosis among household contacts

Index case	Age/sex (years)	Contact population	TST +N (p. rate)	SPPTB Prevalence rate	SNPTB Prevalence rate	Overall TB Prevalence rate
SPPTB N=34	0-4	27	26(96.3)	nil	2(7.4)	7.4
	5-14	75	61(81.3)	nil	1(1.3)	1.3
	15-59	90	80(88.8)	6(6.7)	30(33.3)	40
	>60	7	2(28.6)	3(42.8)	4(57.2)	100
	male	94	87(92.5)	5(5.3)	18(19.1)	24.4
SNPTB N=30	female	91	82(90.1)	4(4.4)	19(20.9)	25.3
	0-4	16	10(62.5)	nil	nil	
	5-14	58	55(94.8)	nil	nil	
	15-59	71	67(94.4)	2(2.8)	8(11.3)	14.1
	>60	8	2(25.0)	5(62.5)	3(37.5)	100
Total	male	86	70(81.4)	3(3.5)	6(6.9)	10.4
	female	81	64(79.1)	4(4.9)	5(6.2)	11.1
Total		352	303(86.1)	16(4.5)	48(13.6)	18.1

TB; tuberculosis, SPPTB; smear positive pulmonary tuberculosis, SNPTB; smear negative pulmonary tuberculosis, TST; tuberculin skin test.

were important risk factors for tuberculosis in HC. Treatment with corticosteroid was associated with increased risk of tuberculosis, although that was not statistically significant. BCG vaccination and INH prophylaxis were effective preventive measures for TB in household contacts.

DISCUSSION

The present study showed a considerably higher prevalence of active tuberculosis among household contacts than in the contact outside the household (18.2% vs.1.6%). The prevalence rate of TB among contacts in community is higher than upper limits of rates in the Iranian general population (1.6% vs.0.2%). The prevalence rate of symptomatic TB in Iran varies from 0.1 to 0.2 in different parts of the country.¹⁶ This study described variability in prevalence of TB for different age groups. The disease was more prevalent in the middle aged and elderly than in children. Our finding is consistent with Kumar and colleague in India,¹⁷ but different with Guwatudde, et al from Africa.¹¹ We believe that continuous super infection in middle aged and elderly who might have been infected many years ago, precipitates the adult type of

tuberculosis. BCG vaccination and INH prophylaxis (according to Iranian vaccination program and INTP, all newborns receive BCG in the first week of life and all HC below the age of six years receive INH) were the two factors that reduced the risk for TB among child contacts. These findings support the continued use of BCG vaccination and INH prophylaxis in Iran where transmission of *M. tuberculosis* is high and where HIV infection among IVD addicts is increasing.

Our study described that the prevalence of TB in men is similar with women. Earlier investigators had reported different prevalence rate in men and women.^{6,11,17,18} These different results may be due to variation in socioeconomics and style of life in various parts of the world.

In this study we found that in both the contact groups, household and community, the prevalence of the disease was higher among the contacts of smear positive sources(24.8% and 2.2%) than in contacts of smear negative sources(10.8% and 0.9%). This finding is in agreement with previous studies.^{1,3,6,11,17} On the basis of this finding, it may be concluded that though the sputum positive patients pose a

Table-III: Risk factors and preventive measures for household transmission of tuberculosis

<i>Risk factors</i>	<i>Secondary tuberculosis</i>	<i>Without secondary tuberculosis</i>	<i>P value</i>
Age (years) 0-4	2(3.2)	41(14.2)	0.006
5-14	1(1.6)	132(45.8)	<0.0001
15-59	46(71.8)	115(39.9)	0.0006
>60	15(23.4)	0.0	
Sex male	32(50)	148(51.4)	0.47
female	32(50)	140(48.6)	
HIV/AIDS	12(18.7)	25(8.7)	0.02
IDU addiction	12(18.7)	15(5.2)	00009
Corticosteroid therapy history	4(6.2)	6(2.1)	0.08
INH prophylaxis	2(3.1)	49(17)	0.001
BCG vaccinated	12(18.7)	166(57.6)	<0.0001
Total	64(100)	288(100)	

HIV/AIDS; human immunodeficiency virus/acquired immunodeficiency syndrome, IDU; injecting drug user, INH; isoniazid, BCG; Bacillus Calmette-Guérin

great problem to their contacts, the risk caused by smear negative patients can not be overlooked and that the examination of contacts of smear negative patients is also essential simultaneously with those of smear positive patients. Our finding further suggest that the influence of patient with TB is not limited to household only but extends to outside the household overcrowded localities such as school, sport club and offices. Philip, et al reported that contacts out side the house such as school, bus and coffeshop are also at the risk of tuberculosis.⁵

In the present study majority (86%) of contact population had tuberculin skin test (TST) reaction 10 mm or more, reflecting latent tuberculosis (LTB). TST rate in Philip's work ranged from 58% to 100% and in the work of Khalilzadeh was 60.5%.^{1,5} The presentation of the secondary TB cases differed from that of the IC and pose challenges to the diagnosis of TB in the HC. We believe that actual diagnosis of active TB at the early stage of TB is impossible, because many of secondary cases presented with paucibacillary and minimal disease. Indeed a proportion of patients, who were considered LTB, may be missed pulmonary tuberculosis.

Once infection has occurred, the risk for disease is attributed to the duration of infection, age, BCG vaccination, HIV infection and chemoprophylaxis.¹⁰ In the current study, we found that elderly/middle aged, HIV infection, IDU addiction and corticosteroid therapy (probably) were associated with increased risk for active TB at the time of contact evaluation, whereas BCG vaccination and INH prophylaxis reduced the risk. Of the 64 secondary tuberculosis 18.7% were HIV-seropositive, indicating the high risk for TB faced by these individuals, as seen in other studies.^{6,10,11}

CONCLUSION

Tuberculosis is common among household contacts of index cases in Ahvaz (Iran), especially among middle aged and elderly, HIV-infected and IDU addicted contacts. New approaches to household contact for diagnosis

of early or minimal disease should be employed. Further efforts to fight addiction and to control HIV infection are essential in reducing household risk for tuberculosis in Iran.

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