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The prevalence of Tuberculosis Infection and Disease among Household contacts of smear Positive Pulmonary Tuberculosis Patients in Diwaniya Governorate

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Abstract:

Background: pulmonary Tuberculosis (PTB) remained a serious threat to the life and it is a major cause of morbidity and mortality worldwide. Although it is a treatable disease, every day about 5,000 die from the disease worldwide.

Subjects and Methods: A cross-sectional study was conducted on all index cases and household contacts were interviewed using special structured questioner to gather information about the epidemiological and socio-demographic characteristics. The household contacts were subjected to tuberculin skin test (T.S.T)

Persons with positive T.S.T were investigated for signs and symptoms of TB. Those with positive findings were assessed by sputum smear examination subjected to chest X-ray. Those with positive finding on chest X-ray were considered as negative PTB. Those with negative finding were re-evaluated for extra pulmonary TB or diseases other than TB.

Results: the total number of household contacts was 586 of 65 index cases, but the response rate was 63.14%. The prevalence rate of Mycobacterium infection among them was 16.8%. Logistic regression analysis demonstrated that the significant potential risk factors are the poverty, smoking, and the close family relation (P0.05). The prevalence of TB disease among household contacts was 3% Logistic regression analysis demonstrated that the only significant potential risk factor is poverty.

Conclusion; Household contacts investigation is an important tool in the detection of new cases of tuberculosis and latent pulmonary tuberculosis, and facilitates early treatment which will prevent the transmission of the disease to other

Key words: household contacts, tuberculosis, latent pulmonary tuberculosis.

Introduction

Tuberculosis (TB) is a recurrent, chronic infectious disease characterized by formation of granulomas with casseations, fibrosis and cavitations. The disease primarily affects the lungs and causes pulmonary tuberculosis, it can also affects intestine, meninges bone, joints, lymph node and other parts of the body.(1)

Tuberculosis remains the major health problem worldwide, but it is more prevalent in under developing countries in which over 95% of cases will occur . It is a major cause of disability and death in many parts of the world, 50% of untreated cases of pulmonary tuberculosis will die within 5

years.[2]. Tuberculosis kills more than any other infectious disease in those countries where 90% of all TB deaths occur. It accounts for 25% of all avoidable deaths, because of limited resources are available to ensure proper treatment and where the risk factors of like poverty, overcrowding and HIV are more common [3,4]. About 75% of TB cases in developing countries affected the most productive age (15-50) years. [5,6]

More than 2 billion people (about one third of the world population) are estimated to be infected with mycobacterium tuberculosis. Global efforts to control TB were reinvigorated in 1991, when a world Health Assembly (WHA) resolution TB as a major global public health problem, and tow targets for TB control were established. A detection rate of 70% of new Acid Fast Bacillus (AFB) smear positive cases, and cure of 85% of such cases by the year 2000[7]

Despite intensive efforts, these targets (detection rate of 70% and cure rate of 80%) were not met, which deferred later to 2005. In this year the case detection rate was 44% which increase from 33% in 2004. The Eastern Mediterranean region office (EMRO) considered as the second lowest in the six world regions. The treatment success rate was 82% which is close to global target[8].

The new stop TB strategy injects new energies to make efforts more comprehensive and effective. Stop TB strategy aims to ensure access to care for all TB patients to reach the 2015 Millennium Developmental Goal (MDG) target 6 for TB to reduce burden of TB worldwide.

Tuberculosis is spread from person almost exclusively by respiratory route. Tuberculosis is acquired by exposure to organism in small airborne droplet nuclei produced by people with active pulmonary or laryngeal TB. During expiratory effort such as cough, sneeze, speak or spit they expel infection aerosol droplets nuclei)0.5-5 micrometer in diameter).[9]

A single sneeze can release up to 40,000 droplet; each one of these droplets may transmit the disease[10]. The risk of infection is directly proportionate to the bacillary density in respiratory secretion. Since the infectious dose of tuberculosis is very low and inhaling less than 10 bacteria may cause infection[11].

Patients with smear positive pulmonary, laryngeal or respiratory tract disease are particularly infectious. Patient who are smear negative (after examination of three sputum obtained at different time) are less infectious[12]

The probability of transmission from one person to another depends upon the number of infectious droplets expelled by active pulmonary TB patient, effectiveness of ventilation, the duration of exposure and the virulence of mycobacterium strain[13].

Aim of study

-To determine the prevalence of mycobacterium infection and TB disease among household contacts of smear positive PTB in Diwaniya governorate.

- To identify potential risk factors of mycobacterium infection and TB disease among those household contacts.

SUBJECTS AND METHODS

Study design

-Across sectional study

Setting

Chest and Respiratory Disease Consultation Clinic in Diwaniya Governorate.

Time of study collection of data was done over a period of six months from 1- March 2010 - 31 – August 2010

Study population

All household contacts of smear positive PTB cases attending the chest and respiratory disease consultant clinic in Diwaniya aged more than 6 months and who accept to participate in the study.

Exclusion criteria

- Household contacts who defaulted from reading T.S.T result

Data collection Tool

Data were collected through direct interview using a structured questionnaire from. This from consists of two parts the first one is for index case and the second one is for household contacts. These forms gather information on basic socio-demographic and epidemiological characters : age, gender , residence

(classified as urban or rural depending on the municipality border), level of education (classified as illiterate, primary school graduate , secondary school graduate and higher graduate) , occupation (classified as governmental , nongovernmental , farmer , others which include children , retired and housewife). The form also includes information on housing condition , family number , number of bed rooms. Crowding index was calculated as the family number / number of bed room. A crowding index of > 3 considered as crowded. The level of poverty was assessed according to the ministry of labor and social affairs definition that everyone who have monthly income of 45 thousands Iraq Dinars and less will be included to the system of the social protection network and regarded as poor. Smoking habit was classified as smoker or nonsmoker.

The index case defined as any case that was diagnosed and registered in chest and disease consultation clinic in Diwaniya as newly smear positive PTB. All patients were informed to bring his or her household contacts (defined as those who share a bed room, kitchen , bathroom or sitting room in the household for at least 30 days prior to the diagnosis of tuberculosis in the index cases[14].

Similar interviews were done by the researcher with the contacts and similar information from those contact were recorded which include: age (classify to less than 6,6 — 55 this the most productive age group and more than 55 years), gender occupation , smoking, any debilitating disease, drug history with special emphasis on immunosuppressant drugs, level of education, family relationship with index case , All household contacts were subjected skin test by using the standard mantoux technique (we use TST type RT 23 SSI 2TE) made by Nederland's vaccine institute . The participants were informed to return back after 48 — 72 hours for reading the result of T.S.T

Positive tuberculin skin test was defined as having induration of 10 mm or more . Those with positive test result were assessed for clinical manifestation of TB mainly chronic cough, fever, night sweating, and loss of weight. The treating physician's decision was depended for final evolution.

Suspected cases will have sputum examination. Those with positive smear exam (smear positive PTB) while those with be assessed by chest x-ray . Those with positive finding (cavitation, plural, effusion, consolidation, hailer and paratracheal lymph node).

Considered as smear negative PTB while those with negative finding will be re-evaluated for extra pulmonary TB or having disease other than TB (pneumonia, bronchiactasis, bronchitis, community acquired disease , typhoid fever, brucellosis) .All steps were done under the supervision of the specialist in the chest and respiratory disease consultation clinic in Diwaniya city.

Statistical Analysis

Statistical package for social science (spss) version 16 was used for data entry and analysis . Chi square and Fisher[s] Exact probability tests used to analyze the association between qualitative variables. Logistic regression test was used to investigate of two or more independent variables with a two – category outcome variable . The level of significance was set at p value of 0.05 or less

RESULTS Index cases

During the period of the study 83 newly smear positive PTB (index cases) were registered in the clinic 65 (78.31%) participated in the study. The epidemiological and demographic characteristic of index cases are shown in table 1.

The mean age of index cases was 42.41 years + 19.96 . About 51% were females. The majority of cases were in age group 16 – 55 (56.9%). About 62% were urban , 53.8% were nonsmoker and 42.1% were illiterate, 47.75% were primary school graduates , 46.2% live in crowded homes.

Table 1. Distribution of index cases by epidemiological and socio- demographic characteristics

Characteristic		NO	%
AGE in years	6-15	6	9.2%
	16-55	37	56.9%
	More than 55	22	33.8%
Gender	Female	33	50.8%
	Male	32	49.2%
RESIDENCE	Urban	40	61.5%
	Rural	25	38.8%
EDUCATIONAL LEVEL	Illiterate	28	43.1%
	Primary	31	47.7%
	Secondary	6	9.2%
OCCUPATION	Governmental	6	9.2%
	Nongovernmental	11	16.9%
	Farmer	8	12.3%
	Other	8	12.3%
	Retired	6	9.2%
	Housewife	26	40%
POVERTY	Poor	26	40%
	Non poor	39	60%
CROWDING	Crowded	30	46.2%
	Non crowded	35	53.8%
SMOKING	Smoker	31	47.7%
	Non smoker	34	52.3%

Household contacts

A total of 586 household contacts of the 65 index cases were identified .

On average nine contacts for each index case . A total of 216 drop out

(145 refuse to participate, 8 not illegible (less than 6 months of age) and 63 not return after 72 hours for reading the T.S.T) yielding a response rate of (63.14%). The epidemiological and demographic characteristic were shown in table 2.

The mean age of household contacts was 21.87% $\pm$ 18.69 years; the majority were in age group 16 – 55 years (44.3%) and 41.15% were son / daughter in family relation . Most of contacts are illiterate (38.9%) and 32.4% are primary school graduates . About 62% were urban, 89.2% were nonsmoker, 51.1% were poor, and 60.5% were living in crowded homes .

Table2. distribution of household contacts by epidemiological and socio- demographic characteristics.

Characteristic	No.	%
Age		
Less than 6 6 —15	88	23.8%
55 — 16	98	26.5%
More than 55	164	44.3%
	20	5.4%
GENDER		
Female	196	53.2%
Male	173	46.8%
RESIDENCE		
Urban	229	61.9%
Rural	141	38.1%
EDUCATIONAL		
Illiterate	218	58.8%
Primary	120	32.4%
Secondary	21	7.5%
Higher	11	3%
OCCUPATION		
Governmental	9	2.4%
Nongovernmental	42	11.4%
Farmer	18	4.9%
Other (include child)	180	48.6%
Retired	12	3.2%
Housewife	109	29.5%
FAMILY RELATION		
Brother / sister	76	20.5%
Father / mother	48	13%
Son / daughter	152	41.1%
Grandson	60	16.2%
Wife / husband	43	9.2%
POVERTY		
Poor	189	60.5%
Non poor	181	39.5%

CROWDING Home Crowded Not crowded	 225 146	 60.5% 39.5%
SMOKING		
Smoker Non smoker	40 330	10.8% 89.2%

In our study the mycobacterium infection rate between the household contacts was 18.6%. Mycobacterium infection was found significantly more common among older age ground (p=0.00). No significant association was found between mycobacterium infection and gender (p= 0.08), and educational status (p=056).

A significant association was found between mycobacterium infection and occupation (p=0.036), mycobacterium infection is more common among retired (33.3%) and farmer (27.8%). Similarly, there is significant association with the family relation and it mostly between father / mother to index case 20.8% and between wife and husband 44.1% (p=0.009). There is also a significant association between tuberculosis infection and smoking (p=0.000), residence (p= 0.0025), crowding (p= 0.001), and poverty (p=0.000) table 3.

Table 3; The distribution of mycobacterium infection among household contact according to epidemiological and socio-demographic characteristics.

Characteristics		mycobacterium infection					p-value
		Present		Absent		Total (370)	
		No. (69)	%	No. (301)	%		
Gender	Female	34	17.3%	163	82.7%	197	0.081
	Male	35	20.2%	138	79.8%	173	
Age	Less than 6	10	11.4%	78	88.6%	88	0.000
	16 – 15	11	12.2%	87	87.8%	98	
	16 – 55	41	25%	123	75%	164	
	More than 55	7	35%	13	65%	20	
RESIDENCE	Urban	49	21.9%	180	78.6%	229	0.025
	Rural	20	14.2%	121	85.8%	141	
	Governmental	2	22.2%	7	77.8%	9	

OCCUPATION	Non-governmental	10	23.8%	32	76.2%	42	0.036
	Farmer	5	27.8%	13	72.2%	18	
	Other	23	12.8%	157	87.2%	180	
	Retired	4	33.3%	8	66.7%	12	
	Housewife	25	22.9%	84	77.1%	109	
EDUCATION	Illiterate	39	17.9%	179	82.1%	218	0.056
	Primary	20	16.7%	100	83.3%	120	
	Secondary	10	47.6%	11	52.4%	21	
	Higher	0	0%	11	100%	11	
FAMILY RELATION	Brother / sister	14	18.4%	62	81.6%	76	0.009
	Father / Mother	10	20.8%	38	79.2%	48	
	Son / Daughter	26	17.1%	126	82.9%	152	
	Grand son	4	6.7%	65	93.3%	60	
	husband / Wife	15	44.1%	19	55.9%	34	
POVERTY	Poor	52	27.5%	137	72.5%	189	0.000
	Non poor	17	9.4%	164	90.6%	181	
CROWDING	Crowded	53	23.7%	171	76.3%	224	0.001
	Not crowded	16	11%	130	89%	146	
SMOKING	Smoker	23	57.5%	17	42.5%	40	0.000
	Non smoker						

		46	13.9%	284	86.1%	330	

In regression analysis we found that family relation (p=.004), smoking (p=.000), and poverty (p=0.001) were significant potential risk factors for mycobacterium infection (table 4).

Table 4; The potential risk factors for mycobacterium infection among household contacts using logistic regression analysis

	B	S.E	Sig	OR	95% CI
Family relation	2.227	.780	.004	9.275	012.2-745.42
Smoking	2.546	.531	.000	12.757	155.3-501.4
Poverty	1.578	.443	.001	4.845	34.2-543.1

In our study the prevalence of tuberculosis among household contacts was 3%. There is 1.08% of smear positive pulmonary tuberculosis and 1.35% of smear negative pulmonary tuberculosis this give as a total of2.43% pulmonary tuberculosis , and 0.54% of extra pulmonary tuberculosis.

There is a significant association between development of the tuberculosis and the family relation . (p=0.029), poverty (p=0.30), while there is no significant association the development of the disease and other variables .

By using logistic regression analysis, we found that three is only a significant association between the development of the disease and the poverty with (p=0.024) table 5.

Table 5; The potential risk factor for TB disease among household contacts using logistic regression analysis.

	B	S.E.	Sig	Or	95% CI
POVERTY	2.325	1.027	0.024	10.229	366.1-765.9

DISCUSSION

Around one third of household contacts did not participate in the study. This may be attributed to either the long distance between the houses of contacts and the clinic where the T.S.T. was done or because the TB disease is still regarded as a social stigma . Household contacts investigation has provided very efficient tool in finding TB cases. Close contacts with index TB case have higher risk of acquiring infection and develop the disease than general population[10]. This was confirmed by several studies among household contact[15,16,17,18].

In this study one of every five contacts show positive reaction to tuberculin skin test which is consistent with (khalilzadeh, et al, 2006)[19], in a three year follow up study on 68 index cases with a total of 224 household contacts in Iran – Ahwaz. 14.7% of them were Afghan refugees.

The prevalence of mycobacterium infection among household contacts was 16.5%.

Our finding is slightly lower than that of (Carlos, et al . 2004)[12] in a study on 69 index cases with a total of 282 household contacts followed for 24 month in Salvador , Bahia , He found on initial investigation oh household contacts the mycobacterium infection prevalence was 23% and in the end study was 31.1%. This result may be due to the repeated T.S.T. which caused the in prevalence at the end of the study, beside most of the families that participates in the study were of extremely low socio-economic condition .

Our findings are also lower than the finding of (Guwatudde , et al.2003)[14] in a study on 302 index cases with 1,206 household contacts in Kampala- Uganda. He found the prevalence rate of mycobacterium infection among household contacts was 66% and this proportion may be due to the fact than 26% of household contacts are children less than 5 years old and secondly about 10.5% of those contacts were HIV positive and thirdly the household were crowded with minimal ventilation; (22%) of house without windows .

Our result are also lower than the finding of (caldera, et al. 2004) [6] in a study on 184 household contacts children and adolescent in Rio de janeiro (Brazil). He found 41% are infection and this may be due to repeated T.S.T. after 8 – 10 week to those contacts who was initially T.S.T. negative and secondly to the fact than 26.9% of children are malnourished and 92% of children came from low income families .

Our finding also lower than the findings of Talay, et al. 2008[4] in a study on 753 household contacts of 153 index cases in Istanbul Eyup TB Dispensary (Turkey) he found that mycobacterium infection prevalence was 41.2% in household contacts under 15 years old This high rat may be due to the fact than most of the regions in dispensary area were of lower socio-economic people and due to the bad aeration in house and to the crowdedness of families .

In this study the prevalence of tuberculosis among household contacts was 3% which is higher than finding of (Marks et al. 2004)[20] who found that the TB prevalence among household contacts was 2% it is also higher than the result of Carlos et al. 2004[12]. He found initially the TB prevalence was 1.1% and at the end of the study was 3.7% it is also higher than the finding of Mercedes et al. 2005[21] in northern Lima Peru, in study on 1,094 household contacts of 208 index cases . He found that the TB prevalence was 0.91% The high rate in our study may be due to the fact than the symptomatic patient who mostly attend the TB clinic.

In this study the TB prevalence was lower than the result of Talay et al. 2008[4]. She found the prevalence of TB was 5.6 , and Khalilzadeh et al. 2006[19] , who found that the TB prevalence was 7.6% , and (Grwattudde et al. 2003) [14] . He also found that the prevalence of TB at the beginning of the study was 4.2% and at the end of study was 6.2%. Caldera et al. 2004[6] found that TB prevalence was 13.6% and these result may be due to the fact than the study population have other risks like HIV infection malnutrition, and poor socio-economic condition.

In this study the potential risk for developing tuberculosis was poverty; this agreed with other studies like Talay, et al. 2008[4] , Dhingra at al. 2004)[15], Marks et al. 2004)[20],caldera et al. 2004[6] and carlos et al. 2004[12], They all found that the poverty is the most important risk factor for developing the disease after getting the infection.

CONCLUSION

1. Those is considerable percent of mycobacterium infection 18.6% and TB disease 3% among household contacts.

2. The potential risk factor for mycobacterium infection among household contacts are close family relation , cigarette smoking and poverty . The potential risk factor for TB disease is poverty .

RECOMONDATIONS

Enforcing continuous investigation of all household contacts of PTB at national level

Ensure availability of Tuberculin skin test and raising capacity of health workers on using it at PHC level

Increase awareness of people about TB through health education to target group at PHCC level and to general population through broadcasting media like TV or radio.

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