

UNIT OF AXIS JOURNALS

International Peer Reviewed Medical Journal Committed for Excellence

**TB contacts in family and high positive smear:
Is there a need of sputum culture at the earliest?**

Kulkarni PY,¹ Kulkarni AD,² Akarte SV³

Associate Professor,¹ Assistant Professor,² Professor & Head³

¹Department of Community Medicine, SMBT Medical College, Dhamangaon, Igatpur, Nasik, Maharashtra, India

²Department of Community Medicine, Dr D Y Patil Medical College, Nerul, Navi Mumbai, Maharashtra, India

³Department of Community Medicine, Grant Medical College, Byculla, Mumbai, Maharashtra, India

ORIGINAL RESEARCH

ABSTRACT

Aim

To assess the role of TB contacts at various places in severity of PTB.

Background

Tremendous progress has been made in combating TB over the past ten years. But, dramatic changes in TB epidemiology are challenging TB control activities.

Material Methods

An observational study at DOTS centers in E ward of Mumbai Municipal Corporation was carried out during 1st January 2004 to 30th June 2004. A Pre-tested structured interview schedules were fulfilled by interviewing new smear positive pulmonary tuberculosis patients registered during study period. Data regarding sputum smear examination report at the beginning & at the end of intensive phase were collected from respective DOTS centre.

Results

156 patients were interviewed with 67.3% males & 32.7% females. 24.2% were illiterate, 43.3% were unemployed, 52% belonged to socio-economic class IV & V, and 53.8% were migrants. 52.6% had history of known TB contact. High positive sputum smear was associated with history of known TB contact in family (p= 0.03, OR= 1.773, 95%CI= 1.102- 3.094). Patients with high sputum smear positivity were more likely to show sputum smear non-conversion at the end of intensive phase (OR= 2.347, 95% CI= 0.953- 5.782).

Conclusion

Contacts in family play important role in causation of severe TB disease & consequently sputum non-conversion which is a risk factor for MDR-TB. Physicians or facilities can take decision about investigations like sputum culture and sensitivity at the earliest for such patients.

Key Words

Anti tubercular treatment (ATT), DOTS, High Positive Smear (HPS), MDR-TB, RNTCP, Tuberculosis

Received on 11 Sep 2014

Accepted on 18 Nov 2014

Published on 30 Nov 2014

INTRODUCTION

Tuberculosis, (TB) barometer of social welfare, is as old as humanity itself. It is second leading infectious cause of human deaths after HIV/ AIDS. South East Asia Region (SEAR) bears about 40% of the global TB burden. It has a pool of nearly 5 million TB cases to which about 3.5 million are added each year.¹ India is the highest TB burden country and it accounts for more than 25% of the world's incident cases.² We have 1.9 million new TB cases annually with more incidence in north and in urban areas.

There are about 3,25,000 deaths due to TB each year & it affects predominantly economically productive age group leading to huge socio-economic impact.³

India adopted the Directly Observed Treatment Short-course (DOTS) strategy for TB control since 1993.⁴ Tremendous progress has been made in TB control activities over the past ten years. The national level estimates of average annual risk of TB infection shows a decline of 3.7% per year between 1997–2007.¹ It has been possible by expansion of

quality DOTS.

But, TB, a social disease, still remains a major public health problem. The pandemic of human immune deficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) has a significant impact on TB epidemic. Migration, overcrowding & changes in lifestyles superadded with already existing adverse social factors caused dramatic changes in TB epidemiology in developing countries including India. ⁵ Emergence of drug resistant (DR), multiple drug resistant (MDR) & extensive drug resistant (XDR) TB, total drug resistant (TDR) TB are the examples of such changes.

TB contacts play important role in TB transmission & maintaining pool of infection. ⁶ Present study was designed to assess the role of TB contacts at various places in the severity of PTB & to find out the factors associated with severity of PTB.

MATERIAL AND METHOD

DOTS under RNTCP is an integral part of public health system in India. TB diagnostic services and treatments are provided free of cost at DOTS centers, TB dispensaries & hospitals run by government.

Study was conducted at 24 DOTS centers located in E ward of Mumbai Municipal Corporation (MMC). All NSP TB patients initiated on category I treatment regimen of DOTS during 1st January 2004 to 30th June 2004 were interviewed as per pre-tested structured interview schedule. It included all socio-demographic variables along-with information regarding housing conditions, history of TB contact, addictions and high risk sexual behaviors were also included in the schedule. Sputum examination results at the time of diagnosis & at the end of 2 months' intensive phase (IP) of anti-tuberculosis treatment (ATT) under DOTS were noted for all patients.

Ethical approval was obtained from Member secretary, Mumbai District TB control Society & ethical committee of Grant Medical College & J J Hospital. Verbal consent was taken from every patient before each interview.

Data analysis was done using SPSS 11.0 software. Frequencies & percentages were enlisted. Chi square test was used as test of significance wherever appropriate.

Definitions used:

1. Sputum smear positivity:

Low positive sputum smear (LPS): Sputum smears graded as scanty & 1 as per DOTS criteria.

High positive sputum smear (HPS): Sputum smears graded as 2 & 3 as per DOTS criteria.

Patients with HPS were considered to have severe PTB, while patients with LPS were considered to have less severe PTB.

2. Nutritional status: After calculation of body mass index

(BMI)⁵.

Underweight: <18.50 Kg/m²

Normal: 18.50- 24.99 Kg/m²

Overweight: ≥ 25.00

Socio-economic status was assessed by Kuppuswami's method (urban) ⁵ of social classification of an individual which is based on education, occupation and income per month in rupees.

RESULT

Table 1: Socio-demographic characteristics of study subjects.

Characteristic	Frequency	Percent
Age		
20-39	89	56.7
Other	68	43.3
Gender		
Male	106	67.5
Female	51	32.5
Migration		
Yes	83	52.9
No	74	47.1
Married		
Yes	82	52.2
Single	75	47.8
Employed		
Yes	88	56.7
No	69	43.3
Literacy		
Illiterate	38	24.2
Literate	119	75.8
Social class*		
II, III, IV	100	63.7
V	57	36.3
History of haemoptysis		
Yes	12	7.1
No	145	92.9
History of TB contact		
Yes	82	52.9
No	73	47.1
Place of known TB contact		
In family	48	57.1
Other than family	36	42.9
Diabetes mellitus		
Yes	9	5.7
No	148	94.3
Tobacco chewing		
Yes	66	42.3
No	90	57.7
Smoking		
Yes	54	34.6
No	102	65.4
Alcohol consumption		
Yes	59	37.8
No	97	62.2
Known female sex worker		
Yes	4	8.5
No	43	91.5
Aberrant sexual history		
Yes	21	13.4
No	136	86.6
Living with own family		
Yes	92	58.3

No	65	41.7
Adverse housing condition		
Yes	136	86.6
No	21	13.4
Overcrowding at home		
Yes	127	81.4
No	30	18.6
Cross-ventilation at home		
Yes	32	18.7
No	125	81.3
Separate kitchen		
Yes	57	36.5
No	99	63.5
Smoke produced by fuel used in kitchen		
Yes	66	50.8
No	64	49.2
Scar of BCG		
Yes	74	47.4
No	83	52.6

Total 156 NSP TB patients were studied. Median age of the patients was 30 years (min= 14, max=71),majority (53.7%) being in the age group of 20 — 39 years. 67.3% (105/156) were males & 32.7% (51/156) were females.

24.2% (38/156) patients were illiterate. 43.3% (68/156) were unemployed. TB was underlying cause of unemployment for 20.6% (14/68). Median duration of unemployment as 3 months (Range= 11 months). Patients from social class V were 37% (56/156) & 23/156 (15%) belonged to social class IV.

Total, 53.8% (84/156) were migrants. Median duration of migration was 3 years. 82 (52.8%) were married & out of 8 widowed patients, spouses of 3 had died due to TB.

87.82% (137/156) patients resided in adverse housing conditions like slums, chawls, pavements. 92.70% (127/137) had overcrowding in house, 96.35% (132/137) did not have adequate cross ventilation which dramatically dilutes or increase the concentration of infectious droplet nuclei.⁶

Tobacco chewers were 42.3% (66/ 156), 37.8%(59/ 156) patients were alcoholics and aberrant sexual history was elicited from 11/156 patients. 30/156 patients had other co-morbidities like diabetes mellitus (DM), ischaemic heart disease(IHD) and/ or arthritis requiring long term treatments. 3/30 (10%) patients were known patients of HIV/AIDS, 2 of them received ART concurrently with ATT, 1 had discontinued it.

Mean body mass index (BMI) was 17.75 kg/meter² (±SD: 3), 63% (99/156) patients were underweight in our study.

History of TB contact

52.6% (82/156) had history of contact with known TB patient prior to diagnosis. Majority of contacts were from family [Figure-1]. Median duration since contact was 12 months (min=1, max=240 months). Known TB contacts of 85.4% (70/82) patients had received ATT from government or municipal dispensary, 2.5% (4/82) from pvt, of 2.5%

(4/82) did not take any ATT & treatment history of 2.5% (4/82) was not known to the patient.

Sputum smear positivity

At the initiation of ATT, 49% (76/156) patients had HPS & 51% (80/156) had LPS. 25% (38/156) patients had grade 3 of sputum smear positivity for AFB (Figure 2). 30/38 were in the 15- 49 year age group.

30.77% (48 /156) had known TB contact in family, 54.2% (26/48) of them had HPS at the initiation of IP as compared to 30.6% (11/36) who had known TB contact at other than family (p= 0.03, OR= 1.773, 95%CI= 1.102- 3.094) (Table 2).

Table 2: Association of TB contact in family & grade of sputum smear at the initiation of IP

Place of Known TB contact	HPS	LPS	Total
In family	26 (54.2)	22 (45.8)	48 (100)
Other	12 (30.6)	24 (69.4)	36 (100)
Total	37 (44)	47 (56)	84 (100)

P= 0.031, OR= 1.773, 95% CI= 1.016- 3.094

Thus, HPS was significantly associated with history of known TB contact in family as compared to contact at other places. HPS was not associated with any other socio-demographic factor like age, overcrowding & cross ventilation in house, smoking, tobacco & alcohol consumption, high risk sexual behavior, nutritional status, etc (p> 0.05).

Sputum smear conversion at the end of IP

Out of 156 patients, 125 (80.12%) had sputum smear examination at end of IP. 60/125 had HPS at the initiation of ATT & 65/125 had initial LPS. 15.2% (19/125) did not show sputum conversion. 21.7% (13/60) of patients with HPS at the initiation of ATT did not convert while only 9.2% (6/65) of patients with LPS at the initiation of ATT did not convert sputum smear at the end of IP. We tested association of sputum smear positivity at initiation of ATT & sputum smear conversion at the end of IP, which just missed the statistical significance (p= 0.053), but patients with initial HPS were more likely to show sputum smear non-conversion at the end of IP (OR= 2.347, 95% CI= 0.953- 5.782). [Table-3]

Table 3: Sputum smear positivity at initiation of ATT & at the end of IP

Sputum smear positivity	At initiation of ATT (%)	Sputum smear examination done at end of IP	At the end of IP	Conversion rate (%)
LPS (Scanty + Grade I)	80 (51)	65	6	90.77
HPS (Grade II + Grade III)	76 (49)	60	13	78.33
Total	156 (100)	125	21	84.55

DISCUSSION

Study revealed that contacts in family play important role in severity of TB disease than contacts at other places.

Household exposure to TB is considered as most intense exposure to TB.⁷ H. Zaher et al (2000) observed high risk among household contacts of SSP- TB patients (RR=46.1, 95% CI=14 — 155).⁸

Out of 82 patients who gave history of known TB contact, 39 patients had TB contact in family. All were living in overcrowded & poor housing conditions which facilitate spread of TB infection that is too with high infective dose of TB bacilli in absence of cross-ventilation.

Pre-treatment sputum smear grading is a direct measure of number of bacilli present in a sputum smear & it denotes severity of TB. Initial HPS results in delayed smear conversion. Retrospective study done by Singla R. *et al.* at L.R.S Institute of Tuberculosis and Respiratory Diseases, New Delhi.^{9,10} Lienhardt *et al* reported that as initial sputum smear grade increased, smear conversion decreased at the end of IP as in patients with initial sputum smears 1+,2+ and 3+ to be 96.2%, 85.8% and 81.8%, respectively.¹¹ In our study, smear conversion for scanty & 1+ (LPS) was 90.77% and for 2+ & 3+ (HPS) was 78.33%.

Table 4: Sputum smear positivity at initiation of ATT & sputum smear conversion

Sputum smear positivity at initiation of ATT	Sputum smear conversion at end of IP		Total
	No	Yes	
HPS	13 (21.7)	47 (78.3)	60 (100)
LPS	6 (9.2)	59 (90.8)	65 (100)
Total	19 (15.2)	106 (84.8)	125 (100)

p=0.053, OR= 2.347, 95% CI= 0.953- 5.782

Sputum smear non-conversion or delayed conversion is a significant risk factor for adverse treatment outcome & for developing Multi Drug Resistant Tuberculosis (MDR TB).¹² Physicians can take decisions about investigations like sputum culture and sensitivity at the earliest for patients with initial HPS to rule out DR and other investigations to detect co-morbid conditions like DM, HIV etc.

Family size also influence chance of exposure to TB infection from the patient.¹³ Median number of persons exposed to patient at residence was 4 (min=1, max=18). Chief complaints of cough with expectoration were noted in at least one person living with them in 4/156 (2.56%) patients.

Physicians or facilities treating TB patients should focus on educating patient and his/ her family regarding TB & its precautionary measures to decrease TB transmission to others. It will also help to improve treatment seeking behavior at the earliest if symptoms arise. Electronic displays displaying such information in patient friendly

language can be installed at DOTS centers for this purpose. Screening strategies for family members of NSP TB patients are needed to be initiated under existing program.

47.4% (74/156) patients were having scar of BCG on left deltoid. We had 14.74% (23/156) adolescents, out of them 43.48% (10/23) did not have scar of BCG which is mainly beneficial to prevent serious disseminated disease in childhood.⁶ Although, absence of scar of BCG was not associated with severity of TB, it throws light on inadequate BCG coverage, specially in past few decades, under national immunization program.

Although, there is a well-established association of TB & HIV infection and apart from clinical deterioration, HIV co-infection also contributes to emergence of multi-drug resistant (MDR) strains,^{6,14,15} we did not find association of HPS with HIV or other co-morbid conditions. We had only 3 patients who were known to have HIV/AIDS, 2 were receiving ART concurrently with ATT, 1 had discontinued it. More specific studies focusing on co-infected patients are needed.

CONCLUSION

Sputum smear examination remains the ideal method of diagnosing and monitoring ATT response. We evaluated various factors associated with initial HPS & sputum conversion rate following two months of ATT under DOTS in E ward of MMC. We found TB contact in family was associated with HPS and Patients with HPS were more likely not to convert sputum smear at the end of 2 months of IP. Further studies are needed to confirm the findings and association of factors could be better understood through a longitudinal study with a larger sample.

REFERENCES

1. WHO. Tuberculosis control in South-east Asia Region. The regional report: 2012.
2. Government of India. Central TB division, DGHS. TB India 2011, RNTCP Annual status report.
3. RNTCP overview [Internet]. Ministry of health & family welfare. [Updated 2007 May.]Available from: www.mohfw.nic.in/NRHM/.../RNTCP_3rd_CRM_Briefing_workshop.
4. Arora VK, Sarin R. Revised National Tuberculosis Control Programme, Indian Perspective. *Indian J Chest Dis Allied Sci* 2000; 42 : 21-26.
5. Park K. Parks textbook of preventive & social medicine. Chapter 5; Epidemiology of communicable diseases, I. Respiratory infections: Tuberculosis. 22nd ed. P.166.
6. Kumareson J. Epidemiology. In Narain JP;eds. Tuberculosis: Epidemiology & control, 1st ed. New Delhi: WHO regional office for South-East Asia; 2002. P.16-7.
7. Guwatudde et al. Tuberculosis in household contacts of

infectious cases in Kampala, Uganda. *Am J Epi* 2003; 158: 887- 98.

8. Zaher H et al. Yield of TB among contacts of new smear positive patients. *mt J of TB & Lung Dis.* Nov 2001 ;5(11): supplement 1: S209.
9. Tiwari S, Kumar A, Kapoor SK. Relationship between sputum smear grading and smear conversion rate and treatment outcome in the patients of pulmonary tuberculosis undergoing dots- a prospective cohort study. *Indian J Tuberc* 2012; 59: 135-140.
10. Rajpal S, Dhingra VK, Aggarwal JK. Sputum grading as a predictor of outcome in pulmonary tuberculosis. *Indian J Tuberc* 2002; 49: 139.
11. Rupak S, Neeta S, Rohit S, Arora VK. Influence of pretreatment bacillary load on treatment outcome on pulmonary tuberculosis patients receiving DOTS under RNTCP. *Indian J Chest Dis Allied Sci* 2005; 47: 19-23.
12. Pande JN, Singh UB, Sinha S, Agarwal RC. Evaluation of Risk Factors and Prevalence of Drug Resistant Tuberculosis in North India. *Chest* 2011; 128 (4): 404S1.
13. WHO. The origins of DOTS. Research for action: Understanding & controlling TB in India. 2000.
14. Narain JJ. HIV associatd TB in developing countries: epidemiology & strategies of prevention. *Tuber Lung Dis* 1992; 73(1): 80- 82.
15. Moss AR et al. Tuberculosis in homeless. *Am J Respir Crit Care Med* 2000; 162: 460- 464.

CORRESPONDENCE ADDRESS

Dr Priya Yogesh Kulkarni

Address: 5, Shanti Sadan, Tarte Colony, Erandawane, Pune-411004, Maharashtra, India.

Phone numbers: (91) 8975968164

E-mail: dr_pdkulkarni@yahoo.co.in

Please cite this paper as: Kulkarni PY, Akarte SV. TB contacts in family and high positive smear: Is there a need of sputum culture at the earliest? *Inter J Medical Sci Res Prac* 2014; 1 (3): 95-99.

ACKNOWLEDGEMENTS

Nil

PEER REVIEW

Double Blinded externally peer reviewed.

CONFLICTS OF INTEREST

Nil

FUNDING

Nil.

Figure 1- Place of known TB contact

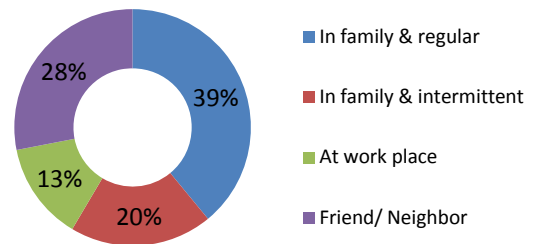


Figure 2- Grade of sputum smear

