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Determinants of lost to follow up during treatment among tuberculosis patients in delhi

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ABSTRACT

Tuberculosis ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus. With more than two million cases of tuberculosis, India remains on top in the list of countries carrying high burden of the disease.Non-compliance to treatment is a problem in TB management as with other long termillnesses. Non- compliance to treatment leads to a major impediment to effective tuberculosis chemotherapy worldwide. A multi stratified study was conducted among 204 newly diagnosed pulmonary tuberculosis and extra pulmonary tuberculosis patients. A structured questionnaire was used to collect information on basic socio-demographic data, Type of TB, family history of disease, socio-economic status etc. Socio-demographic data was summarized as frequencies and percentages. Logistic regression analysis was performed to determine potential risk factors among patients who completed treatment compared to those who defaulted from treatment. Out of 204 TB patients, 87.3% completed their treatment and 12.7% lost to follow up during treatment regime. Univariate logistics regression revealed the significant association of default with occupation, smoking, alcohol consumption, marital status and socio-economic status. It has been found that although medicines are provided free of cost,but there are many disabling factors such as low socio-economic status, family liabilities and burden of losing income from work on male patients which contribute to lost to follow up during treatment.

Keywords: Pulmonary Tuberculosis,Extra-pulmonary Tuberculosis,Lost to follow up,Socio-economic status.

INTRODUCTION

Tuberculosis (TB) is a major public health problem globally. It causes ill-health among millions of people each year and ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus (HIV). In 2013, there were an estimated 9.0 million incident cases of TB and 1.5 million people died from the disease worldwide. Among these deaths there were an estimated 210000 from MDR-TB, a relatively high total compared with 480 000 incident cases of MDR-TB.With more than two million cases of tuberculosis, India remains on top in the list of countries carrying high burden of the disease[1]. The therapeutic regime given under direct observation as recommended by World Health Organisation (WHO) for global TB control is accepted worldwide[2]. Direct observation and regular home visits by treatment providers are provisions to increase treatment completion under Direct Observation Treatment Short course(DOTS). Based on DOTS strategy, India's revised national tuberculosis control program (RNTCP) was launched in 1997[3]. India is currently the second largest DOTS provider in the world[4][5][6].

TB is a disease that is widespread and closely associated with poverty.Poverty and urbanization create the perfect conditions for its transmission. Urbanization leads to higher population densities, crowded living conditions, and increased mobility among migrants seeking temporary work. TB transmission is attributed to crowded living conditions such as slum housing that favour airborne transmission. Indeed, poor and inadequate ventilation has been shown to be one of the factors responsible for the emergence of multi drug resistant TB (MDR-TB)[7]. Along with poor housing quality, crowding, poor air quality within homes as a result of inadequate ventilation, and the presence of mould, dampness and smoke contribute to increase both the likelihood of exposure to Mycobacterium tuberculosis and progression to disease[8-12].

The chronic nature of TB demands that two or more kinds of drugs are taken for periods ranging between 6 and 12 months, depending on the treatment regimen. Because of this, motivation to complete treatment fluctuates in intensity, and loss of follow up may be considered at many stages during treatment. Thus the most difficult task in TB control is to persuade patients to take their drugs regularly and for the required duration[13]. Obtaining high compliance levels in the population under treatment is even more important to a community's welfare as finding new cases. Non-compliance to treatment is a problem in TB management as with other long term illnesses. The problem of poor compliance among TB patients was recognized more than 50 years ago, and globally it is estimated that only 50% of TB patients are successfully treated[14]. Non- compliance to treatment leads to a major impediment to effective tuberculosis chemotherapy worldwide[15] and places at risk the health of the individuals, their family and the wider community, as well as wasting health resources[16].

Treatment behaviour is influenced by many factors such as prolonged duration of treatment, the need for multiple drugs, socio-economic factors and drug toxicity, perceived health benefits and subjective experience of illness[17][18]. Previous research reported travel expenses, traveling to treatment centres, male sex, poor patient information and communication, alcoholism and homelessness as the major determinants of non-compliance to anti TB treatment[19][20][21]. Thus, non-compliance to treatment by TB patients is a complex and multifaceted behavioural issue that needs to be understood better[22].

Incomplete anti tuberculosis treatment (ATT) results in increased transmission rates of the tubercle bacilli, delay in sputum conversion to smear-negative, morbidity, mortality and eventually rise cost to the TB control programmes[23]. It is the reason for the emergence of multi drug resistant strains of TB bacillus that emerged in the early 1990s, extensively drug resistant strains emerged in 2006 and now totally drug resistant strains emerged in 2012 in India[3]. Its management and treatment is very difficult and expensive thus over stretching the already strained resources for TB control in most developing countries[24]. Therefore, the present study is embarked to identify the risk factors associated with lost to follow up during treatment among TB patients treated under DOTS.

MATERIALS AND METHODS

Study Area

The study was conducted amongst the newly diagnosed Pulmonary tuberculosis (PTB) and Extra pulmonary tuberculosis (EPTB) patients who were enrolled under RNTCP DOTS programme of Kingsway Camp Chest Centre (KCC) - defined area from the North-West zone of Delhi. The data was collected from March 2013 to September 2014.

DOTS under Revised National Tuberculosis Control Programme are an integral part of the public health system in India. TB diagnostic services and treatments are provided free of cost at DOTS centres, TB dispensaries and hospitals run by government. When a patient is diagnosed with TB, he/she is referred to the DOTS centre closest to his/her residence. At the DOTS centre, the patient is registered; a treatment card and a patient identity card are developed. The treatment card contains information on patient's demographic, treatment history; dates associated with current DOTS treatment and are maintained at the DOTS centre. The patient identity card contains information on patient's current treatment and is carried by the patient. It is updated by the DOTS centre staff. After a positive diagnosis of TB both pulmonary and extra-pulmonary, the patient is categorized to receive a particular drug regimen (Category I, II, or IV) based on the results of laboratory diagnosis and past history of TB. All the three categories of treatment consist of two phases of treatment: intensive and continuous phases. During the intensive phase, the patient comes to the DOTS centre three times a week and receives drugs under direct supervision. During the continuous phase, the patient comes to the DOTS centre once a week; receives one dose under supervision and carries home the remaining doses for the week. The above process is continued until the end of the treatment regimen.

Study Design and Data collection

A multi stratified study was conducted among 204 adult TB patients enrolled in Category- I of the treatment regime. The age group of the study cohort was 18-50 years. For the present study the data was collected within a week of starting their treatment and then followed up twice during treatment period i.e. at the end of intensive phase and in the last week of continuation phase (end of treatment). For the present investigation patients who lost to follow up formed the cases, while those who completed treatment made up the control group. Out of 204 patients,178 completed their treatment and 26 lost to follow up during treatment. As per World Health Organisation definition of lost to follow up is defined as "A TB patient whose treatment was interrupted for 2 consecutive months or more" and treatment completed as"A TB patient who completed treatment without evidence of failure but with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results are unavailable"[24].

A structured questionnaire was used to collect information on basic socio-demographic data, type of TB, family history of disease, socio-economic status etc. TB register and treatment cards of patients were reviewed at each follow upfor treatment details such as drug regularity, number of doses taken by the patients and time of lost to follow up were obtained from treatment cards.

The inclusion criterion for the present study were newly diagnosed cases of PTB and EPTB taking treatment under category I of the RNTCP. The patients were excluded if they came under any of the following criterions: pregnancy, known HIV positive status or AIDS patients, had any active or chronic disease, or those who were unable to comply.

The purpose and procedure of the study was explained to all the patients prior to data collection and a written consent was obtained from each patient who volunteered for the study. The study protocol was duly approved by the institutional ethical clearance committee.

Data was entered and analysed using the SPSS17 version. Socio-demographic data was summarized as frequencies and percentages. Logistic regression analysis was performed to determine potential risk factors among patients who completed treatment compared to those who defaulted from treatment. A $p<0.05$ was considered as statistically significant.

RESULTS

Tabe 1. Baseline characteristics of the study population

Type of TB	Treatment completed		Lost to follow up	
	N	(%)	N	(%)
PTB	119	(66.90)	19	(33.10)
EPTB	59	(73.10)	7	(26.90)
Total	178	(87.3)	26	(12.7)

As shown in Table1. the study cohort consisted of 204 TB patients, out of which 178(87.3%) completed their treatment and 26 (12.7%) lost to follow up. Among the TB patients who completed their treatment, 119 (66.9%) had pulmonary TB and 59 (73%) had extra-pulmonary TB. Among the lost to follow up cases 19 (33.1%) suffered from pulmonary TB, and 7(26.9%) had extra-pulmonary TB.

Table 2. Socio –demographic characteristics of the study population

VARIABLES	N	(%)
SEX		
Male	133	55.4
Female	91	44.6
Age		
18-30 years	151	74
31-50 years	53	26
Mean±SD	26.9	±8.4
Marital status		
Unmarried	116	56.9
Married	88	43.1
Members in household		
<5	110	53.9
>5	94	46.1
Occupation		
Unemployed (including students and housewives)	138	67.6
Self-employed/Daily wager	32	15.7
Job	34	16.7
Education		
Higher secondary and above	129	63.24
Primary	29	14.2
Illiterates	46	22.5
Alcohol consumption status		
Yes	44	21.6
No	160	78.4
Smoking status		
Yes	47	23
No	157	77
Family History of TB		
Yes	94	46.1

	No	110	53.9
Socio-economic status			
	Middle class	110	46.1
	Poor	94	53.9
Waiting time at health centre		119	58.3
	<30 minutes	85	41.7
	> 30 minutes		
Living status			
	With family	181	88.7
	Alone/with friends	23	11.3

Table 2. presents the socio-demographic characteristics of the study cohort. Descriptive analysis of the investigated cohort shows that 151(74%) were in their most economically productive age group. More than half 133(55.4%) were males,116 (56.9%) were married. Almost two-third 138(67.6) were unemployed and had secondary and higher education.

Smokers were 47 (23%) and alcoholics were 44 (21.6%). Patients belonging to middle class socio economic status were 110(53.9%). Majority 181(88.7%) were living with their families and 110 (53.9%) had a family size of less than 5 members in a household. 94(46.1%) had a family history of the disease.

Table 3. Univariate logistic regression analysis between socio-demographic factors and defaulting

VARIABLES	OR	95% CI		p-value
		Lower bound	Upper bound	
SEX				
Male	1.97	0.813	4.76	0.134
Female	0[a]			
Age				
18-30 years	0.761	0.31	1.87	0.552
31-50 years	0[a]			
Marital status				
Married	2.84	1.09	7.42	**0.032**
Unmarried	0[a]			
Members in household				
<5	1.73	0.731	4.08	0.213
>5	0a			
Occupation				
Unemployed	0.31	0.115	0.832	**0.02**
(including students and housewives)				
Self-employed/Daily wager	0.75	0.228	2.47	
Job	0[a]			
Education				
Higher secondary and above	0.53	0.21	1.38	0.195
Primary	0.99	0.29	3.38	0.987
Illiterates	0[a]			
Alcohol consumption status				
Yes	3.22	1.36	7.65	**0.008**
No	0[a]			
Smoking status				
Yes	2.38	0.1	5.68	**0.05**
No	0[a]			
Family History of TB				
Yes	0.84	0.37	1.93	0.68
No	0[a]			
Socio-economic status				
Middle class	0.4	0.17	0.95	**0.04**
Poor	0[a]			
Waiting time at health centre				
<30 minutes	1.76	0.77	4.02	0.181
> 30 minutes	0[a]			
Living status				
With family	0.97	0.27	3.53	0.964
Alone/withfriends	0[a]			

Univariate analysis of these factors as shown in table.3, revealed the significant association of default with occupation, smoking, alcohol consumption, marital status and socio-economic status.

It was shown that patient who were employed in jobs and those who were self-employed were likely to have 3.2 times and 2.4 more risk of lost to follow up than those who were unemployed. Similarly smokers and alcoholics had 3.2 and 2.4 times increased risk of being non-compliant to treatment as compared to non-smokers and non-alcoholics. Patients belonging to poor socio economic status had 2.5 times high risk of leaving their treatment in

between in comparison to middle class patients. Married patients were 2.8 times more likely to be lost to follow up than unmarried ones. However no significant association had been shown by sex, age, education, living status, waiting time at health centre, and members in household with lost to follow up in treatment.

Table 4. Factor loadings of principal component analysis with varimax rotation

Variables	Component			
	1	2	3	4
Age		0.55		
Sex	0.825			
Marital status		-0.67		
Livingstatus	-0.43			
Smoking status	0.681			
Alcohol consumption status	0.784			
Waiting timeat health centre				0.91
Family history of TB			0.734	
Socio-economic status		0.64		
No.of members in household			-0.66	
Occupation	-0.54			
Education		0.796		
Variance	20.29	15.71	11.92	8.98

Kaiser-Meyer-Olkin Measure of Sampling Adequacy: 0.644
Bartlett's Test of Sphericity $p<0.01$, Cumulative $R^2=56.9$

Table 4. shows the clustering of socio-demographic characteristics of TB patients. The Kaiser-Meyer-Olkin statistic, a measure of sampling adequacy (KMO-0.712) indicated that the pattern of correlations is adequate and factor analysis would yield distinct and reliable factors. Significant Bartlett's test for sphericity (<0.001) reveals existence of relationship between the variables included in the factor analysis and acceptability of factor model. According to the criterion of an eigenvalue greater than 1.0, four factors were extracted in the exploratory factor analysis. The cumulative percent of variance accounted by these three factors was 56.9%. For each factor, variables with factor loading greater than 0.4 were retained in the model.

Factor 1 consisted of variables like Sex, living status, smoking alcohol and occupation and largest proportion of total variance (20.29%). Factor 2 comprised of age, marital status, socio-economic status and education with 15.71% variance. Family history of TB and number of members in household characterize the factor 3 and explained 11.2% of the variance. Factor 4 consisted of waiting time at health centre with 8.9% variancein the model.

DISCUSSION

World Health Organisation places high emphasis on achieving high compliance levels than finding new cases[25]. Non-compliance increases the likelihood of developing multi-drug resistance TB (MDR-TB) and extreme-drug resistant TB (XDR-TB). This will further increase the burden of a disease that is already very great and increases the costs of its management[26].

The present study has documented a lost to follow up rate of 12.7%. This finding is comparable to other studies conducted in Mumbai, India[21] and Nepal[27]where the non-compliance rates were 16% and 16.1% respectively. Previous investigations conducted worldwide among patients receiving DOTS treatment had reported non adherence rates ranging from 5% in Malawi[28]to 29.8% in Zambia[29].

In the context of published literature, our study findings are in line with some and inconsistent with others. Among demographic factors, it was found that gender, age, total no. of members in household and education were not risk factors of non-compliance. This finding is in line with many other studies[30][31][32].

Logistic regression analysis in search for factors strongly associated with default revealed that marital status, occupation, smoking, alcoholism and poor socio-economic status act as potential risk factors.

Patients who were married had a higher risk of lost to follow up compared to those who were single. A possible explanation could be family responsibility and associated lack of money and time which may have reduced their attention to health care. Our finding is contrary to studies in Kenya[33]and China[34]where patients who were singles had higher risk of defaulting compared to patients who were married. However, our finding is similar to a study in Bangalore, India[22]and Benin city,Nigeria[35]which indicated a statistically significant association between patients who were married and lost to follow up.

A significant effect of being employed on patients' compliance was found, corroborating the findings of O'Boyle et al[20]. He reported that non-compliant patients were more likely to be workers. This was attributed to the fact that the travelling time for an employed patient represents a time absent from work. Coupled with the fact that some employers may not take kindly to the frequent long periods during which TB patients need to attend health facilities for treatment, means that long-term treatments such as that for TB may pose huge problems for such individuals[23]In the present study, the possible explanation for non-compliance among employed patients could be because they belonged to lower socio-economic strata and they were the sole bread earning members of their family.These factors may put a lot of stress on them, to the extent that as soon as they begin to feel better, they will choose to return to work to continue to providefor their families. However, in the present study females and students constituted majorityof unemployed group, due to time available to go to DOTS centre to take doses on proper time, the unemployed patients were more towards complying with the treatment. However a study done by Gopi et al in South India found no association between treatment compliance and employment status[36].

Most of the patients in the studied population were also poor and this makes it difficult for them to afford the cost of transport and other essential needs during the treatment. For such patients, motivation to continue with treatment decreases over time and the moment they begin to see improvement in their condition, lost to follow up from treatment was the most appealing option. Similar observations were shown in a Ghanian study[14].

We had found alcohol consumption during the treatment period to be a risk factor for non- compliance. Alcohol consumption is extremely predominant among lower socio-economic class individuals in Delhi and combined with deprivation of adequate nutrition is likely to lead to severe reactions like vomiting and nausea, thus promoting non-compliance to TB treatment among patients. Another possible explanation could be the improvement in one's health status as they progress through the phases of TB treatment. It is likely that as patients take longer on treatment, they may revert back to their drinking habits possibly because they feel their health status had improved as opposed to those who have just started.

Our results were consistent with previous investigations. Alcoholism had been reported as a significant factor of patient non-compliance among tuberculosis patients receiving DOTS treatment in Mumbai, India[21] and Denver, USA[37]. Innovative strategies are urgently needed for managing this problem.There is immense need for continuous, effective and reinforcing health education to the patient and his family. Male alcoholics need to be counseled and repeatedly motivated from the starting of the treatment. Time and efforts should be invested during treatment as these factors could easily be identified without additional inputs[22].

Smoking was also found to be positively associated with lost to follow, among newly diagnosed patients. A similar finding was observed among TB patients receiving standard TB regimen in Mumbai, India[21], Saudi Arabia[38]and among TB patients receiving DOTS therapy in New York City, USA [39]. None of the previous studies have suggested a possible reason why smoking was positively associated with lost to follow up during the treatment.

Our study findings revealed that waiting time at health centre and living status did not had a significant association with non-compliance. These findings were in agreement with a Ghanaian study[14]and an Indian study[40].This conflicts results from other studies that showed significant associations[41-43]. It is thus possible that although this may be an important factor among this population, but we did not had sufficient sample size to detect any association.

Four factors extracted from principal component analysis showed that variables in each clusters are interlinked with each other and cumulatively affects treatment compliance. So rather than considering them as an independent factors these should be treated in a nested way. However, further studies with different research design need to be conducted to explore interwoven relationship between factors which hinders compliance to the treatment.

CONCLUSION

This study has demonstrated few of the factors which influence lost to follow up in TB treatment. Although medicines are provided free, the burden of cost to travel to the treatment facility can be a disabling factor in completing treatment. In congruence with this, low socio-economic status, family liabilities and burden of losing income from work on male patients contribute to non-compliance. Improved education for patients, their families and the general population may improve compliance, effective solutions addressing travel related concerns, modification of lifestyle behaviours and emphasizing on motivating patients to come to the DOTS centre to receive therapy are essential to treatment completion among TB patients in an urban setting like Delhi, India.

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