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Socio-demographic profile of TB-HIV co-infected adults and it's association with tuberculosis treatment outcome, in a South Indian city

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ABSTRACT

Background: Human immune deficiency virus (HIV) and tuberculosis (TB) are major public health challenges and are intricately linked to other public health challenges like malnutrition, unemployment, alcoholism, drug abuse, poverty, homelessness and even mortality. In 2013, 360,000 deaths from HIV associated TB equivalent to 25% of all TB deaths, and around 25% of the estimated 1.5 million deaths from HIV/AIDS .Prognosis in these diseases depends on factors such as health seeking behavior and compliance to drug regimen which further depend upon various sociodemographic factors, hence it is decided to study the socio-demographic correlates of TB-HIV co-infected adults and their association with TB treatment outcome in Bangalore Municipality area.

Methods: A longitudinal observational study was carried out, from November 1st 2010 to December 30th 2011, on HIV-TB co-infected adults receiving Revised National TB control program's (RNTCP) Directly Observed Treatment Short-course (DOTS) from 5 randomly selected Tuberculosis units of Bangalore Municipality area, by interview method using a questionnaire.

Results: Majority of the 162 HIV-TB co-infected adults studied were males (74%), belonging to fourth decade of life, and most came from low socio-economic stratum and most were educated only till middle school (70%). Most common occupation was unskilled labour (17.3%), and among women, 58% were house wives. Disability due to the diseases had led to unemployment of many who were earlier employed. Most patients belonged to Hindu (80.2%) religion, live in nuclear families (67.9%), and come from urban slums (55.8%). Three fourths of the patients were either currently married (103, 63.6%) or had been married. TB treatment success rate was 90.5%. Although there were differences in the proportion of successful and unsuccessful outcomes of TB treatment among groups pertaining to socio-demographic attributes of patients, none of these differences were statistically significant.

Conclusions: HIV-TB co-infection was common among males, middle aged adults, low socio-economic class, those with low education and among unskilled labourers, but none of these socio-demographic attributes had significant relation with the TB treatment outcome.

Keywords: HIV-TB co-infected, Socio-demographic profile, TB treatment outcome

INTRODUCTION

Worldwide, 9.6 million people are estimated to have fallen ill with TB in 2014: 5.4 million men, 3.2 million women and 1.0 million children. Globally, 12% of the 9.6

million new TB cases in 2014 were HIV-positive. The dual epidemic of HIV and TB is a concern for India where both these diseases are prevalent in epidemic proportions. India is a country where an estimated 40% of the population is infected with M.TB, the situation hence

becomes grimmer for the PLHAs who are more vulnerable than the general population to get infected from TB, as well as to suffer from re-activation of primary TB. ¹⁻⁵

The prime mode of transmission being the sexual route, HIV infection is more common in the sexually active age group, which coincides with the economically productive age-group that TB commonly affects.4 TB and HIV are intricately linked to malnutrition, unemployment, alcoholism, drug abuse, poverty and homelessness. The prognosis in these diseases depends on factors such as health seeking behavior and compliance to drug regimen which further depends upon factors like income, alcohol abuse, previous default, male gender, old age, unmarried status, unemployment etc.^{5,6} It can be seen that the factors associated with the transmission and prognosis of both these infections are mainly the social and economic factors and the diseases share some common demographic factors too. Hence, a good understanding of the social, demographic and economic factors influencing these diseases is an important aspect for the success of the control programs. This study was designed to obtain this very information in an urban setting of South India, where rapid and unpredictable urbanization has lead to a correspondingly shifting socio-demographic profile of its people and to establish links if any, between these sociodemographic attributes and TB treatment outcomes.

METHODS

This was a longitudinal observational study carried out between 1st November 2010 & 31st October 2012, on adult HIV-TB co-infected patients, receiving TB treatment in five (selected by simple random sampling: Dasappa TU, Hanumanthanagar TU, Jayanagar TU, Halasuru TU and Broadway TU) of the nine RNTCP's Tuberculosis units (TU) of the city's Municipality (Bruhat Bangalore MahanagarPalike -BBMP) area.

Patients who fulfilled the following criteria were included in the study: (1) Individuals aged 18 years or above, who consented to participate in the study and, (2) diagnosed with tuberculosis between 1st November 2010 to 31st October 2011 & treated with DOTS, as per RNTCP-II guidelines and, (3) diagnosed to be infected with HIV at any point of time before or during TB treatment.

Data was collected using a pre tested and semi-structured questionnaire by personal interview. Most patients were interviewed at their DOTS centers during their scheduled visit to collect their DOTS dosages or at their home. All enrolled patients were once again interviewed after treatment completion.

Data was analysed using Epi-Info statistical software version 3.4.1. Descriptive analysis was done (means, proportions, percentages) for demographic details.

Difference between continuous variables among groups was assessed by student t-test. Categorical variables were compared using Chi square test and Fischer's exact test. P value of <0.05 was considered significant.

Definitions

Socio-economic status: Modified Kuppuswamy's socioeconomic status scale (2011) was utilised to assess socioeconomic status of patients.

Operational definitions of outcome measures for TB treatment were the same as followed by RNTCP, which is as given below:

- Successful treatment: "Cured" (Patient who is sputum smear-negative in the last month of treatment and on at least one previous occasion) and "Treatment completed" (Patient who has completed treatment but who does not meet the criteria to be classified as cured or treatment failure and is free of symptoms or signs of TB) were considered as successful TB treatment.
- Unsuccessful treatment: Death (irrespective of the cause), and treatment failure (Patient who is sputum smear-positive at 5 months or later after starting treatment) were considered as unsuccessful TB treatment.
- Defaulter: Patient whose treatment was interrupted for 2 consecutive months or more.

RESULTS

Of 4855 patients of tuberculosis registered for DOTS in the 5 TUs within the study period, 268 (5.5%) were HIV infected. Of these 180 patients (excluding Transferred-in and Transferred-out cases) matched the inclusion criteria, of which 162 were approached, all of whom consented to participate.

The study sample had a near equal distribution of extra pulmonary TB (77, 48%), and pulmonary TB (79, 48.8%), remaining (6, 3.2%) were disseminated TB. Most patients were in the 4^{th} decade (30 – 39 years) of life, mean age being 37.56 years (SD = 9.69) and median age 36 years. Youngest patient was 19 years and oldest was 77 years of age. There were more males (73.5%) than females, male to female ratio being 34 females per 100 males (1: 0.336) (Table 1).

Most patients belonged to Hindu (130, 80.2%) religion, remaining were Muslims (20, 12.3%) and Christians (12, 7.4%). Majority (110; 67.9%) lived in nuclear families, 40 (24.7%) were from Joint families, 8 (4.9%) were from 'three generation' family and four (2.5%) lived alone. Majority came from Urban slums (91, 55.8%), rest lived in (42, 25.8%) residential layouts and commercial areas (03, 1.8%).

Table 1	: Distribution of patie	nts according to	age and gender

Age group in years	Male	Female	Trans-gender	Total (%)
18 - 19	0	1 (2.5)	0	1 (0.6%)
20 - 29	18 (15.1)	10 (25.0)	1 (33.3)	29 (17.8%)
30 - 39	52 (43.7)	15 (37.5)	1 (33.3)	68 (42.0%)
40 - 49	35 (29.4)	6 (15.0)	1 (33.3)	43 (26.4%)
50 - 59	11 (9.2)	6 (15.0)	0	16 (9.8%)
60 – 69	2 (1.7)	2 (4.9)	0	4 (2.5%)
>70	1 (0.8)	0	0	1 (0.6%)
Total	119 (73.5)	40 (24.7)	3 (1.9)	162 (100%)
Mean age (in years)	38.11	36.40	33.33	37.60
Standard deviation	9.158	11.329	11.45	9.752

Table 2: Distribution of patients according to educational and occupational status.

	Frequency	%
Educational status		
Illiterate	20	12.3
Primary school certificate	35	21.6
Middle school certificate	60	37.0
High school certificate	35	21.3
Intermediate or post high school	9	5.6
diploma		
Graduate	3	1.9
Total	162	100
Occupational status		
Unemployed	22	13.6
Unskilled work	48	29.6
Coolie / Daily wage labour	28	
Peons/ Hotel or bar suppliers	6	
House-maids/Domestic help	8	
Sex-worker	2	
Other unskilled work	4	
Semi-skilled work	12	7.4
Painter	5	
Welder/Tile-cutter/Masons/Barber	7	
Skilled work	22	13.6
Driver	15	
Carpenter/Electricians/Lab-	7	
technician/Tailor		
Clerical/Shop-owner/Farmer	34	21.0
Receptionists/Clerks/Sales-	14	
person/Social-worker		
Business*	19	
Farmer	1	
Semi-professionals : Teachers/	3	1.9
Priest		
Professionals	0	
House wife	21	13.0
Total	162	100

^{*}Real estate agents, provision store and vendors (flower/fruit/vegetable/vessels).

Most (70%) patients were educated only till middle school. Most common occupation was unskilled labour (28, 17.3%), followed by driver (14, 8.6%) and self-occupied/business-men/women (9, 5.5%) (Table 3). One third of the drivers were auto-rickshaw drivers and among the self-occupied/business-men/women, most were either roadside or footpath vendors. There were 3 sex-workers (2 of them were transgender and 1 female). Disability due to the diseases had led to unemployment of many who were earlier employed (Table 2). Socioeconomic status of most (67.3%) was low, rest (32.7%) belonged to middle class (Table 3).

Table 3: Socio-economic status as per Kuppuswamy's classification (2011).

Socioeconomic status	Frequency	%
Upper/ Class I	0	0
Upper middle/ Class II	4	2.5
Lower middle/ Class III	30	18.5
Upper lower/ Class IV	105	64.8
Lower/ Class V	23	14.2
Total	162	100

Three fourths of the patients were either currently married (103, 63.6%) or had been married in the past (Separated/ divorced = 12, 7.4%; Widow/Widower = 8, 4.9%), 5% had lost their partners (some of these partners were also infected with TB and/or HIV). One fourth (39, 24.1%) were never married.

None of the transgender patients used tobacco, one consumed alcohol. None of the female patients reported use of tobacco, alcohol or any drug abuse. Three females & 49 males were past tobacco users. One female, 44 males and one transgender were past alcohol users.

There were 164 episodes of TB disease among the 162 HIV-TB co-infected patients (including two episodes of recurrence of TB and re-registering for TB treatment after successful completion of TB treatment during the study period), 163 outcomes were achieved by the end of this study. There were two cases of treatment failure, one of

whom was initiated DOTS plus/Category IV regimen (Multi Drug Resistant TB treatment schedule of RNTCP) which was still on course at the end of this study, the other's regimen were changed to Category 2 (RNTCP treatment schedule for retreatment cases/2nd or more episode of TB), to which she responded. Excluding

'default/treatment discontinued' cases (16 patients whose final outcome is not known), there were 147 outcomes. Of this, one was of the second episode, hence, 146 outcomes among 119 males, 40 females and one transgender were analyzed for association with sociodemographic factors.

Table 4: Distribution of patients according to treatment outcome.

Treatment outcome	Male (%)	Female (%)	Total (%)
Successful treatment outcome Treatment completed Cured (+ 2nd episode)	97 (81.5) 66 (55.5) 31 (26.0)	35 (85.4) 32 (78.0) 2 (4.9) + 1 (2.4)	133 (81.6)* 99 (60.7)* 34 (20.9)
Unsuccessful treatment outcome Death Treatment failure Multidrug resistant TB	0 (11.9) 0 (7.6) 1 (0.8)	4 (9.7) 3 (7.3) 1 (2.4)	14 (8.5) 12 (7.3) 2 (1.2)
Treatment default	12 (10.1)	2 (4.9)	16 (9.9)#
Total outcomes	119	41	163 (100)

^{*} Inclusive of one transgender subject; # Inclusive of two transgender patients.

Table 5: Association of socio-demographic factors with treatment outcome.

		DOTS outcome	DOTS outcome		
		Successful (%)	Unsuccessful (%)	P*	
Gender	Male (n= 107)	97 (90.7)	10 (9.3)	0.760	
Gender	Female $(n = 38)$	34 (89.5)	4 (10.5)	0.700	
Age	<30 years	37 (88.1)	5 (11.9)	0.545	
	>30 years	95 (91.3)	9 (8.7)	0.545	
Literacy	Illiterate (n=17)	16 (94.1)	1 (5.9)	0.494	
Literacy	Literate (n= 129)	116 (89.9)	13 (10.1)	0.474	
Religion:	Hindu (n=117)	106 (90.5)	11 (9.5)	1.00	
	Other $(n=29)$	26 (90.0)	3 (10.0)	1.00	
Marital status	Married (n=96)	90 (94.0)	6 (6.0)		
Maritar status	Unmarried/Widow/ Widower/ Divorced/			0.188	
	Separated (n=50)	42 (84.0)	8 (16.0)		
Family Type	Nuclear/ Bachelors (n= 101)	95 (93.9)	6 (6.1)	0.132	
Tanniy Type	Joint/ 3 generation (n= 45)	37 (83.3)	8 (16.7)	0.132	
Socio-economic strata	Lower class (IV) (n=114)	103 (90.4)	11 (9.6)	0.633	
Socio-economic strata	Middle class (II & III) (n=32)	29 (90.6)	3 (9.4)	0.033	
Alcohol consumption	Yes (n= 21)	18 (85.7)	3 (14.3)	0.426	
Alcohol consumption	No (n=125)	114 (91.2)	11 (8.8)	0.420	
Tobacco use	Yes (n= 22)	19 (86.4)	3 (13.6)	0.444	
	No (n=124)	113 (91.1)	11 (8.9)	0.444	

^{(*} Fischer's exact test, at 95% CI).

Excluding defaulters from analysis, TB treatment success rate was 90.5%. Proportion of successful outcome was more among: males compared to females; those aged more than 30 years than the younger; those who lived in nuclear families than other types; those who were married than the others; those who belonged to Middle class than lower class; but none of these differences were statistically significant (at α <0.05, 95% CI). Proportion

of unsuccessful DOTS outcome was more among those who reported alcohol consumption or tobacco use but this too was not statistically significant (at α <0.05, 95%CI)

DISCUSSION

Our study showed 5.5% prevalence of HIV infection among TB patients. This is close to national statistics.

According to UNAIDS report on global AIDS epidemic 2010, HIV prevalence among incident TB cases in India is 5.0% (3.3 – 7.1).^{3,7,8} A study by R. Ramachandran et al, in North Tamil Nadu of India, which is geographically close to our study setting showed an overall HIV seroprevalence among TB patients of 4.7%.⁹

HIV-TB co-infected in this region was mostly males (74%) and majority were in the fourth decade of life. Other studies in this region as well as elsewhere showed a similar trend. A study by Rajasekaran S et al on similar study group in South India, showed that majority were males (71.4%) in 30 - 44 years age group $(66.1\%)^{10}$ Joge US et al in a study in ART centre showed that HIV-TB co-infected were mostly males (68.04%) and most were between 20 & 39 years.¹¹ Indian studies by Deivanayagam CN et al (males = 79.25% and 74.94% belonged to 21-40 years), Swaminathan S et al (males = 83%) and Zuber Ahmad et al (males = 85.7%) had similar results. 12-14 Indian National Statistics (NACO) (4) also reported that HIV-TB co-infected comprised 74% males and 89% in the age group of 15-44 years. This pattern is similar in other developing countries as well, as shown by Angela Naomi Atomiya et al in Brazil (male = 76%, 30 - 39 years = 45%).

Most (80.2%) patients were Hindus, which is consistent with the proportion of population in each religion in Karnataka State (Hindus – 83.9%). The Urban family structure is reflected in our study as most were from nuclear families. A study on adult tuberculosis patients by Rajeshwari et al observed that 68.09% patients were from nuclear families and even in the general population the nuclear family constitutes 63% of households in urban India. The constitutes of th

Nearly two-thirds subjects were not educated beyond Middle-school, this could be an important factor to the current morbidity status (co-infection) of these patients as low educational status is a contributory factor for low awareness of transmission of diseases. A study by Rajashekaran S et al showed that illiterates among such a population was 20.1%, our study had 10% illiterates. 10 Rishi et al showed HIV-TB co-infection was more common among illiterates, and its incidence reduced with increasing level of education. The occupation profile of our study population mainly comprised Unskilled labourers followed by drivers, and more than a tenth were unemployed, mostly due to the disease. Mohanty et al and Ahmad Z et al found similar occupation profile with unskilled labour comprising the majority, and a large number of unemployed patients. 14,18

Two-thirds patients belonged to low socioeconomic status and none from upper class. The upper class in most parts of India, do not use Government healthcare facilities, hence probably none from the upper class were present in this study setting which is a Government program (RNTCP). Joge US et al. found similar profile with 66% of HIV-TB co-infected belonging to Low

(Class IV and V) socioeconomic status. ¹¹ Rishi JK et al in a similar Government study setting, showed absence of people belonging to upper class. ¹⁹

Nearly one third of subjects in our study were unmarried, which is higher than that revealed by other studies. Rajashekaran S et al. showed that unmarried among such a population was lower at 13.1%. ¹⁰ Joge US et al found a similar majority (70.53%) were married but a larger proportion of widows & widowers (20%) than what was seen in our study. ¹¹

Treatment success rate in TB-HIV co-infected in this region as observed in our study is better (at 90.5%) than for the same group in the rest of the world (73%) and in the country (76%). Compared to 8% mortality in our study, globally it was 11% and in India it was 2.4%. ²⁰ Outcome rates of our study is better than that in other developing countries, as was observed in Nigeria by Oshi DC et al. where 65.8% patients achieved successful outcomes, 34.2% had unsuccessful outcomes; here like our study finding, there was no statistically significant association between demographic variables and TB treatment outcomes, although one variable (residence of patients/ variation in healthcare facilities) showed a statistically significant association between TB treatment outcomes. ^{21,22}

CONCLUSION

HIV infection has contributed to 5.5% of the TB burden in Bangalore Municipality area. TB-HIV co-infection is more common among males and the economically productive age group. Majority belong to low socioeconomic class, had low education and were mainly unskilled labourers. TB treatment outcome of TB-HIV co-infected adults in this region was not influenced significantly by any of their socio-demographic attributes.

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