

# Various factors related to development of category I tuberculosis and its relationship with outcome in urban area of Jamnagar

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## ABSTRACT

**Background:** India has highest number of tuberculosis (TB) cases in terms of absolute number of cases that occur each year. TB is a social disease and described barometer of social welfare. Every year one-fourth of the global incident TB cases occur in India. **Objective:** This study is done to know various social and demographic factors and its impact on treatment outcome of Category I TB patients in an urban area of Jamnagar. **Materials and Methods:** A longitudinal study was carried out enrolling all Category I TB patients under directly observed treatment, short-course treatment during the period from July 2014 to December 2014 (2-quarter), in the urban area of Jamnagar. After necessary exclusion total 199 patients were visited personally, interviewed and followed up to completion of treatment. At the end of completion of treatment, final outcome was noted. **Results:** Out of total 199 patients, the patients between 16 and 45 years age group were 59.30%, male was 69.35%, literates was 78.39%, and laborers were 36.18%; overall treatment success was 81.91%. Among total 118 new sputum positive patients, success rate was 78.81%. And relationship between type of TB and treatment outcome was found statistically significant ( $P = 0.008$ ). Among total 68 patients in age group of more than 45 years success rate was 72.06%. And relationship between age and treatment outcome was found statistically significant ( $P = 0.016$ ). Patients belong to lower class (Class IV and V) were 48.24% and relationship between social class and treatment outcome was found statistically significant ( $P = 0.008$ ). Out of 72 (36.18%) laborer patients, successful treatment outcome was found in 69.44% of patients. Relationship between occupation and treatment outcome was found statistically significant ( $P = 0.008$ ). Relationship with overcrowding and ventilation condition with successful treatment outcome was also found statistically significant ( $P = 0.01$  and  $P = 0.02$ , respectively). **Conclusions:** The findings of this study suggest that mostly affected people were lower socioeconomic class, with higher unsuccessful treatment outcome. Variable such as occupation, overcrowding, and poor ventilation also associated with unsuccessful treatment outcome. Improvement in quality of life is necessary for better outcome. Future program or research should focus on improvement of quality of life by addressing such social and demographic issues for better outcome.

**KEY WORDS:** Tuberculosis; New Sputum Positive; Category I; Successful Outcome

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## INTRODUCTION

Tuberculosis (TB) remains a major public health problem in the world. It infects one-third of world population at any given point of time of whom 5-10% will develop clinical disease during their lifetime. It has also been described as barometer of social welfare. Social factor includes many

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nonmedical factors such as poor quality of life, poor housing, overcrowding, population explosion, undernutrition, smoking, alcohol abuse, lack of education, large family, and lack of awareness of illness.<sup>[1]</sup>

One-fourth of the global incident TB cases occur in India annually.<sup>[2]</sup> In India, 2013 Incidence (includes HIV + TB) was 171/1,00,000 population, and the prevalence (includes HIV + TB) was 211/1,00,000 population with mortality was 19 (including HIV + TB) per 1,00,000 population.<sup>[3]</sup> With the setback of National TB Control Program in controlling TB, the Government of India together with World Health Organization reviewed the National TB program keeping in view of the severity of the problem, launched its revised strategy, i.e., "Revised National TB Control Programme (RNTCP) in 1992." The objectives of the program are to achieve at least 85% cure rate through "directly observed treatment, short-course (DOTS) chemotherapy."

Considering the long-term nature of the therapy, the sociodemographic and clinical profile of the patients could have an impact on treatment success. It is necessary to know sociodemographic factors such as age, sex, economic characteristic, effect of smoking, symptoms, treatment type, and weight gain after treatment is important. This study was done to know various social and demographic factors and its impact on treatment outcome of Category I TB patients in an urban area of Jamnagar.

## MATERIALS AND METHODS

A longitudinal study conducted over a period from June 2014 to August 2015 in urban area of Jamnagar city. The study was conducted on patients registering for treatment under RNTCP in the district TB center. All Category I TB patients registered for DOTS treatment during the period from July 2014 to December 2014 (2-quarter) included in this study.

In this study retreatment TB patients, patients on private AKT, patients on non-DOTS treatment, patient who could not be traced out after three visits (either migrated within short time of starting treatment or given wrong address), patient who were from out of study area (transferred out), during treatment patient shifted to Category IV treatment, patient who died due to causes other than TB or accident were excluded from the study. So considering exclusion criteria, in this study 199 patients included in the study.

First visit was done after patient registered for DOTS treatment, within 2 months of starting of treatment, at this time demographic profile, social status, environmental condition, personal history, family history, addiction and clinical symptoms of disease were noted. First follow-up was done after the end of intensive phase, i.e., during 3-4 months of DOTS initiation. During this visit adherence with treatment,

sputum report of the end intensive phase noted. Second follow-up was performed at the end of continuation phase, and before the end of July 2015. During this visit history regarding symptoms and conversion report were noted.

The data entry was performed using EPI INFO version 3.5.3, and data analysis was performed using Microsoft Office Excel 2007 and MedCalc.

## RESULTS

There were total 199 patients registered at district TB center for treatment. The mean age (+standard deviation) of the patients were  $35.40 \pm 15.32$  years, and around 59% of the patients were within the age range of 16-45 years. In this study, the distribution of study population shows that the male was 69.35% and the female were 30.65%. There were total 13 patients below 16 years and among them around 61% were female (Table 1).

In this study, out of 199 patients, illiterate patients were 21.61%; laborer were 36.18%; patients who employed either doing business or services were 26.13%; patients belong to lower class were around 48%. There were around 60% of the patients living in overcrowding condition, and around 48% of the patients having poor ventilation in their houses (Table 2).

With respect to the type of Category I TB, new sputum positive (NSP) patients were around 59% and out of them 78.81% of patients successfully treated; new smear-negative (NSN) patients were around 8% and among of them 62.50% of patients successfully treated; extrapulmonary patients were 32.66% and among of them 92.30% of patients successfully treated. And relationship between type of TB and treatment outcome was found statistically significant ( $P = 0.008$ ) (Tables 3 and 4).

Overall treatment success rate was 81.90%. Unsuccessful treatment includes treatment failure, lost to follow-up patients (defaulters), patient who switched on MDR treatment and patient died (death during any time on treatment either due to disease or related complication). Out of 68 above 45 years age group patients 49 (72.06%), patients were successfully treated. And relationship between age and treatment outcome was found statistically significant ( $P = 0.016$ ). When comparing treatment outcome with education status, among 43 illiterate

**Table 1:** Age and sex wise distribution of patients ( $n=199$ )

Age (years)	Sex (%)		Total (%)
	Male	Female	
<15	5 (38.46)	8 (61.54)	13
16-45	80 (67.80)	38 (32.20)	118
>45	53 (77.94)	15 (22.06)	68
Total	138 (69.35)	61 (30.65)	199

**Table 2:** Distribution of patients according social and demographic characteristics

Characteristics	Frequency (%)
Sex	
Male	138 (69.35)
Female	61 (30.65)
Education	
Illiterate	43 (21.61)
Literate	156 (78.39)
Social class*	
Upper class	103 (51.76)
Lower class	96 (48.24)
Occupation	
Business	36 (18.09)
Laborer	72 (36.18)
Service	16 (8.04)
Study	24 (12.06)
None**	51 (25.63)
Family H/O TB present	64 (32.00)
Environmental condition	
Overcrowding	120 (60.30)
Poor ventilation	96 (48.24)

\*Upper class is Class I, Class II, and III and lower class is Class IV and V, \*\*none includes housewife, retired person. TB: Tuberculosis

**Table 3:** Distribution of patients according type ( $n=199$ )

Type	Frequency (%)
NSP	118 (59.30)
NSN	16 (8.04)
Extra pulmonary	85 (32.66)
Total	199 (100)

NSP: New sputum positive, NSN: New smear-negative

patients, treatment success rate was 79.10%. And relationship between education and treatment outcome was not found statistically significant ( $P = 0.74$ ) (Table 4). On comparison with social class and treatment, outcome lower class (modified Prasad classification Class IV and Class V) having only 73.95% treatment success rate. And relationship between social class and treatment outcome was found statistically significant ( $P = 0.008$ ) (Table 4). Out of 72 (36.18%) laborer patients, successful treatment outcome was found in 69.44% of patients. Relationship between occupation and treatment outcome was found statistically significant ( $P = 0.008$ ). In this study, relationship with overcrowding and ventilation condition was also found statistically significant ( $P = 0.01$  and  $P = 0.02$ , respectively) (Table 4).

## DISCUSSION

The effectiveness of TB treatment has been improved substantially since the implementation and expansion of

DOTS strategy.<sup>[4]</sup> However, this strategy is being challenged by poor treatment outcomes including low adherence, treatment failure, and death in many countries, especially in low- and middle-income countries.<sup>[5]</sup> Reason behind low adherence and treatment failure is mostly socioeconomic class, poor housing condition, and educational status. The WHO has recommended routine monitoring of treatment outcomes to determine the effectiveness of TB control program and to circumvent the adverse outcomes.

In this study, we evaluated the treatment outcomes of 199 Category I patients registered in district TB register during July 2014 to December 2014. In this study, maximum numbers of patients (80 patients) were within the age range of 16-45 years and the mean age of patients was  $35.40 \pm 15.32$  years. In this study, the distribution of study population shows that the male patients were 69.35% and the female patients were 30.65%. In one study done by Kanungo et al., it shows maximum number of cases was in the age group of 15-30 years and mean age was calculated to be 36.9 years.<sup>[6]</sup> In Josheph et al. study, it shows the mean age of all patients was  $38.78 \pm 14.17$  years of Category I patients, around 69% of patients were between 20 and 50 years age group and around 75% were male.<sup>[7]</sup> Another study conducted by Rajeshwari et al. showed that 69% male and 84% female were in the economically productive age group 15-49 years.<sup>[8]</sup>

In this study, illiterate patients were 43 (21.61%) and among them 79.10% of patients were successfully treated. No association was found between education and successful treatment outcome. It was also observed that unsuccessful outcome in laborer was around 30%. Association between occupation and treatment outcome was found highly significant ( $P = 0.008$ ). In laborers are more prone to irregular treatment due to daily wedges work, and likely defaults. In this study, treatment success rate among upper class found around 87.50% and among lower class 73.95%. In Gajbhare et al. study, treatment success rate was highest in middle class 41/48 (85.40%). Treatment success rate was 21/28 (75%) in lower middle class while it is 6/7 (85.7%) in lower class.<sup>[9]</sup> Similar study done by Belo et al. reported higher risk of unsuccessful outcome in the lower socioeconomic class with odd ratio 1.6 (1.02-2.4).<sup>[10]</sup> Lower success rate in lower class shows the lack of awareness of severity of disease. The lower class individuals are mostly daily workers (laborer), thus they could not give enough time for their own health. There was significant association between treatment success and socioeconomic class of an individual ( $P = 0.008$ ).

It also observed that some factors of physical environment like overcrowding and ventilation also affects successful treatment outcome. Relationship with overcrowding and unsuccessful outcome found statistically significant ( $P = 0.01$ ). Poor ventilation was also associated with unsuccessful treatment outcome ( $P = 0.02$ ). In this study, successful treatment outcome in NSP cases around 78%,

**Table 4:** Impact of various factors on treatment outcome of Category I patients (n=199)

Characteristic	Treatment outcome		P value
	Successful (%)	Unsuccessful (%)	
Age (years)			
≤45	114 (84.61)	17 (15.39)	Chi-square=5.792, Df=1 P=0.016
>45	49 (72.06)	19 (27.94)	
Sex			
Female	50 (81.96)	11 (18.04)	Chi-square=0.03, Df=1 P=0.85
Male	113 (81.88)	25 (18.12)	
Educational status			
Literate	129 (82.69)	27 (17.31)	Chi-square=0.104, Df=1 P=0.74
Illiterate	34 (79.10)	9 (20.90)	
Social class*			
Upper class	92 (87.50)	11 (12.50)	Chi-square=6.911, Df=1 P=0.008
Lower class	71 (73.95)	25 (26.05)	
Occupation			
Business	33 (91.67)	3 (8.33)	Chi-square=13.539, Df=4 P=0.008
Laborer	50 (69.44)	22 (30.56)	
Service	14 (87.50)	2 (12.50)	
Study	23 (95.83)	1 (4.17)	
None**	43 (84.31)	8 (15.67)	
Overcrowding			
Yes	91 (75.83)	29 (24.17)	Chi-square=6.534, Df=1 P=0.01
No	72 (91.14)	7 (8.86)	
Ventilation condition			
Poor	72 (75.00)	24 (25.00)	Chi-square=5.109, Df=1 P=0.02
Adequate	91 (88.35)	12 (11.65)	
Type of Category I			
NSP	93 (78.81)	25 (21.19)	Chi-square=9.574, Df=2 P=0.008
NSN	10 (62.50)	6 (37.50)	
Extra pulmonary	60 (92.30)	5 (7.7)	

\*Upper class is Class I, Class II, and III and lower class is Class IV and V, \*\*none includes Housewife, retired person. NSP: New sputum positive, NSN: New smear-negative

in NSN around 62% and in extra pulmonary around 92%. In study done by Lanjewar et al., it shows 77.58% success rate in new smear +ve cases, 83.06% success rate in new smear -ve cases, and 88.65% success rate in extra pulmonary cases.<sup>[11]</sup>

It was community-based study. We visited each registered patients and interviewed them personally at the time of registration and subsequently followed up them after completion of initiation phase and at the end of completion of the treatment. This study done in urban area of city and it covered only patients of 2-quarter.

## CONCLUSION

TB is a major health problem in low- and middle-income country till date. Reasons behind it are poverty, poor housing and environmental conditions, educational status,

social class, poor nutrition status, etc. In this study, it is seen that social factors such as education, socioeconomic class, and occupation have great impact on successful treatment outcome. It is also found that age, poor ventilation and overcrowding are also significantly associated with unsuccessful outcome. Future policy, program or research should focus on improvement of quality of life, creating awareness by education in population as well as reducing the duration of treatment for better compliance with.

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