International Journal of Community Medicine and Public Health
Bineni C et al. Int J Community Med Public Health. 2018 Apr;5(4):1419-1423
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20181210

Original Research Article

A study on role of sputum conversion rate in management of tuberculosis in South Indian population

Chandrasekhar Bineni[1], Pradeep Yarasani[2]*, G. Ravi Prabhu[3]

Department of Community Medicine, [1]Fathima Institute of Medical Sciences, Kadapa, [2]Katuri Medical College, Guntur, [3]ACSR Medical College, Nellore, Andhra Pradesh, India

Received: 27 January 2017
Accepted: 20 April 2017

***Correspondence:**
Dr. Pradeep Yarasani,
E-mail: fims.faculty@gmail.com

ABSTRACT

Background: Directly observed treatment short course (DOTS) is the currently recommended control strategy for tuberculosis. Even after intensive phase of directly observed treatment short course, there is delayed sputum smear conversion in some patients due to multiple factors. The present study was undertaken to study the role of sputum conversion in management of tuberculosis.
Methods: A total of 229 patients with smear positive Tuberculosis cases of both Category-I and Category-II from DOTS centre in tuberculosis, S.V.R.R. Government General Hospital, Tirupati, A.P were enrolled and registered for the present study. Consent was taken from the patients to study the role of Sputum conversion rate importance in management of Tuberculosis in South Indian population.
Results: The sputum conversion rate has been found to be higher in Category I (93.2%) compared to that of Category II (80.8%) and the difference is also found to be statistically significant. The sputum conversion rate has been found to be higher in those who were one + initial grade of sputum 96.1% followed by scanty grading 93.3%.
Conclusions: The present study suggests that special attention should be given to patients enrolled for DOTS II regimen to improve sputum conversion rate in management of tuberculosis.

Keywords: Conversion, DOTS, Sputum, Tuberculosis

INTRODUCTION

Tuberculosis is a chronic infectious disease primarily affects lungs and causes pulmonary tuberculosis. It can also affect intestines, meninges, bone and joints, lymph glands, skin and other tissues of the body causing extra-pulmonary tuberculosis.[1] In India tuberculosis is silently killing 500000 of people every year, more than 1000 per day and more than two every three minutes.[2] The direct and indirect costs of illness due to TB is enormous, estimated to be more than 30 percent of the annual household income in developing countries and have a catastrophic impact on the economy in the developing world.[3] In the Revised National Tuberculosis Control Program, smear conversion at the end of the intensive phase (IP) of treatment is emphasized as an important early predictor of treatment success. The sputum conversion results are used both for management of patients and for monitoring programme performance.[4] The present study was undertaken to study the role of sputum conversion rate and its importance in management of tuberculosis in south Indian population.

METHODS

The present study was conducted in DOTS centre in Tuberculosis Unit attached to S.V.R.R. Government General Hospital, Tirupati, A.P to study the socio demographic profiles of the patients attending tuberculosis clinic and its one of the major variable

sputum conversion rate in south Indian population. All the smear positive Tuberculosis cases of both Category I and Category II registered were enrolled as study subjects. A total of 229 patients were registered as per the inclusion criteria. These patients were followed up till the completion of their treatment. The study was explained and permission obtained from the DTCO, DMHO, MO-TC, HOD of Pulmonary medicine and concerned DOTS providers of study area after the clearance from Ethical committee.

RESULTS

The sputum conversion rate has been slightly higher in <25 years' age group 97.3% compared to other age groups. Higher proportion of sputum conversion was found in females 98.0% compared to that in males 88.2% and the difference is also statistically significant (Table 1). Similar sputum conversion rates are found with regard to religion (Hindu- 89.8%; Muslim- 94.1%; Christian- 92.3%) with no statistically significant difference among them. Higher conversion rates are found with regard to other castes 97.5% and least in scheduled tribes 77.8% but the differences are not statistically significant (Table 2). The sputum conversion rate has been found to be higher in Category I (93.2%) compared to that of Category II (80.8%) and the difference is also found to be statistically significant (Table 3). Slightly higher conversion rates are found in those with degree and above 96.6% and higher secondary 93.0% levels of educational status. The sputum conversion rate was found to be similar with regard to various categories of marital status (Table 4). The sputum conversion rate was found to be comparatively better in those coming from third generation family 94.4% but the differences are not statistically significant. Those living in urban non-slum area had higher sputum conversion rate 92.3% than those living in other areas but the difference is not statistically significant. Those living alone had higher sputum conversion rate than those living along with family but the difference is not statistically significant. The sputum conversion rate was found to be similar with regard to overcrowding (Table 5). The sputum conversion rate is found to be similar with regard to various levels of socio-economic status (Table 6). The sputum conversion rate has been found to be comparable with regard to current smoking, current chewing of tobacco and current alcohol intake with no statistically significant difference in all the cases (Table 7). The sputum conversion rate is found to be similar with regard to the variables studied like HIV status, previous tuberculosis and history of previous tuberculosis treatment (Table 8). The sputum conversion rate has been found to be higher in those who were one + initial grade of sputum 96.1% followed by scanty grading 93.3%. However the differences are not found to be statistically significant (Table 9). A multivariate analysis of sputum conversion rate as the dichotomous dependent variable with other variables as the predictor variables had showed that only DOTS category I had higher proportion of sputum conversion than Category II (Table 10).

Table 1: Age group and gender by Sputum conversion rate.

S. No	Variable	Sputum conversion rate (%)	Statistical significance
1	**Age group (years)**		
	<25	36/37 (97.3)	*$\chi 2$=0.32; P=0.56; NS
	25–50	108/121 (89.3)	
	>50	63/71 (88.7)	
2	**Gender**		
	Male	157/178 (88.2)	Fisher's P=0.023; S
	Female	50/51 (98.0)	

Table 2: Religion and social category by Sputum conversion rate.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
1	Religion		
	Hindu	167/186 (89.8)	*$\chi 2$=0.46; P=0.79; NS
	Muslim	16/17 (94.1)	
	Christian	24/26 (92.3)	
2	Social status		
	Scheduled caste	51/56 (91.1)	*$\chi 2$=4.12; P=0.13; NS
	Scheduled tribe	21/27 (77.8)	
	Backward caste	96/106 (90.6)	
	Other caste	39/40 (97.5)	

Table 3: DOTS category by Sputum conversion rate.

DOTS category	Sputum conversion rate (%)	Statistical significance
Category I	165/177 (93.2)	Fisher's P= 0.011; S
Category II	42/52 (80.8)	

Table 4: Employment, Education and marital status by Sputum conversion rate.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
1	Employment		
	Employed	123/137 (89.8)	χ^2=0.14; P=0.70; NS
	Unemployed	84/92 (91.3)	
2	Educational status		
	Illiterate	90/102 (88.2)	*χ^2=2.40; P=0.30; NS
	Primary	20/20 (100.0)	
	Secondary	29/35 (82.9)	
	Higher Secondary	40/43 (93.0)	
	Degree & above	28/29 (96.6)	
3	Marital status		
	Currently married	121/136 (89.0)	*χ^2=0.03; P=0.85; NS
	Unmarried	47/52 (90.4)	
	Widowed	34/36 (94.4)	
	Divorced	5/5 (100.0)	

Table 5: Type of family, residential status, staying with family and overcrowding by Sputum conversion rate.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
1	Type of family		
	Nuclear	148/165 (89.7)	*χ^2=0.33; P=0.56; NS
	Joint	42/46 (91.3)	
	Third generation	17/18 (94.4)	
2	Residential status		
	Rural	127/140 (90.7)	*χ^2=0.04; P=0.83; NS
	Urban slum	32/37 (86.5)	
	Urban non-slum	48/52 (92.3)	
3	Staying with family		
	Yes	187/209 (89.5)	*χ^2=0.03; P=0.85; NS
	No (living singly)	20/20 (100.0)	
4	Overcrowding (N=227)		
	Yes	141/154 (91.6)	χ^2=0.85; P=0.35; NS
	No	64/73 (87.7)	

Table 6: Socio-economic status by sputum conversion rate.

Socio-economic status	Sputum conversion rate (%)	Statistical significance
Upper	1/2 (50.0)	*χ^2=0.69; P=0.70; NS
Upper middle	53/56 (94.6)	
Lower middle	53/61 (86.9)	
Upper lower	78/86 (90.7)	
Lower	22/24 (91.7)	

Table 7: Current smoking, tobacco chewing and alcohol intake by sputum conversion rate.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
1	Current smoking		
	Yes	48/51 (94.1)	Fisher's, P=0.23; NS
	No	159/178 (89.3)	

Continued.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
2	Current chewing of tobacco		
	Yes	26/28 (92.9)	Fisher's P=0.47; NS
	No	181/201 (90.0)	
3	Current alcohol intake		
	Yes	54/59 (91.5)	Fisher's P=0.73; NS
	No	153/170 (90.0)	

Table 8: HIV status, previous tuberculosis and history of treatment for tuberculosis by sputum conversion rate.

S. No	Variables	Sputum conversion rate (%)	Statistical significance
1	HIV status		
	Positive	21/21 (100.0)	Fisher's P value = 0.10; NS
	Negative	186/208 (89.4)	
2	Previous tuberculosis		
	Yes	12/13 (92.3)	Fisher's P value = 1.00; NS
	No	195/216 (90.2)	
3	History of previous tuberculosis treatment		
	Never taken	196/217 (90.3)	Fisher's P value = 1.00; NS
	<1 month	5/5 (100.0)	
	>1 month	6/7 (85.7)	

Table 9: Sputum grading at the beginning of the treatment by Sputum conversion rate (%).

Sputum grading	Sputum conversion		Total (%)
	Yes (%)	No (%)	
Scanty	14 (93.3)	1 (6.7)	15 (100.0)
One +	73 (96.1)	3 (3.9)	76 (100.0)
Two +	35 (85.4)	6 (14.6)	41 (100.0)
Three +	85 (87.6)	12 (12.4)	97 (100.0)
Total	207 (90.4)	22 (9.6)	229 (100.0)

Table 10: Multivariate analysis of Sputum conversion rate with various factors.

S. No	Term	Odds ratio (95% CI)	P value
1	DOTS category (I/II)	3.19 (1.25–8.10)	0.014; S
2	Gender (female/male)	5.66 (0.73–43.7)	0.09; NS
3	Social status (OC & BC/SC & ST)	2.02 (0.80–5.05)	0.13; NS

DISCUSSION

Sputum conversion is conventionally considered as the proportion of patients turning sputum negative at the end of intensive phase of treatment out of those who have started treatment as sputum positive In the current study, out of a total of 229 patients, 177 received DOTS I category treatment while the remaining 52 received DOTS II category treatment. It was found that a total of 207 patients became sputum negative after intensive and extended intensive treatment. Thus the sputum conversion rate in this study is found to be 90.4%. In a study in Guwahati, the sputum conversion rate was found to be 84.0% at the end of two months and 92.0% at the end of three months.[5] Similar rate of 93.3% was found in Mumbai study and Morocco study 95.0%.[6,7] A slightly lower rate of 86% was reported in Chennai study and a study in Oman 78.5%.[4,8] Similar rate was found in a study in Chandigarh and cure rate of 89.3% was reported in a study in Mumbai.[9,10] A cure rate of 84.2% was reported in Karnataka study.[11] A high cure rate of 92.8% was reported in New Delhi study.[12] The sputum conversion rate was found to be 95.0% in urban and 83.0% in rural areas on a study conducted in west Bengal. Thus the findings of the present study are similar to other studies in India.[13] In the present study, significantly higher sputum conversion was found in female sex (98.2%) and Category I treatment 93.2%. Higher level was also found with other castes 97.5%, less than 25 years 97.3%, degree & above education 96.6%, upper middle socioeconomic status 94.6%, other religions 93.2% and urban non-slum 92.3%. The sputum conversion rate has been found to be higher in those who were one + initial grade of sputum 96.1% followed by scanty grading 93.3%. However the differences are not found to be statistically significant. A multivariate

analysis of sputum conversion rate as the dichotomous dependent variable with other variables as the predictor variables had showed that only DOTS category I had higher proportion of sputum conversion than category II. In the present study, only the DOTS category influenced the sputum conversion rate in patients. It was found that out of those with sputum conversion, 2+ grade was found to be 36.2% followed by 1+ grade 33.5% in a study.[14]

CONCLUSION

In the present study, the sputum conversion rate was lower with regard to Category II DOTS regimen compared to DOTS I regimen. Hence special attention should be given to patients enrolled for DOTS II regimen to improve sputum conversion rate.

ACKNOWLEDGEMENTS

Authors acknowledge Faculty of Department of Community Medicine, SV Medical College, Tirupathi for their valuable suggestions during this work.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Park K. Park's text book of preventive and social medicine.22nd ed. Jabalpur: M/s Banarsidas Bhanot; 2013: 166-183.
2. Suryakantha AH. Community Medicine with recent advances.1sted. New Delhi: Jitendar P V. Jaypee Brothers Medical Publishers (P) Ltd; 2009: 322-341.
3. Devi SB, Naorem S, Singh TJ, Singh KB, Prasad L, Shanti D. HIV and TB co-infection. JIACM. 2005;6(3):220-3.
4. Rekha VVB. Sputum conversion at the end of intensive phase of Category-1 regimen in the treatment of pulmonary tuberculosis patients with diabetes mellitus or HIV infection: An analysis of risk factors. Indian J Med Res. 2007;126:452-8.
5. Bawri S, Ali S, Phukan C, Tayal B, Baruwa P.A study of sputum conversion in new smear positive pulmonary tuberculosis cases at the monthly intervals of 1, 2 & 3 month under directly observed treatment, short course (dots) regimen. Lung India. 2008;25(3):118-23.
6. Parikh R, Nataraj G, Kanade S, Khatri V, Mehta P. Time to sputum conversion in smear positive pulmonary TB patients on category I DOTS and factors delaying it. J Assoc Physicians India. 2012;60:22-6.
7. Bouti K, Aharmim M, Marc K, Soualhi M, Zahrooni R, Benamor J, et al. Factors influencing sputum conversion among smear positive pulmonary patients in Morocco. ISRN Pulmonol. 2013;486507:1-5.
8. Pajankar S, Khandekar R, Al Amri MA, Al Lawati MR. Factors influencing sputum smear conversion at one and two months of tuberculosis treatment. Oman Med J. 2008;23(4):263-8.
9. Kaur G, Goel NK, Kumar D, Janmeja AK, Swami HM, Kalia M. Treatment outcomes of patients placed on treatment under directly observed therapy short course (DOTS). Lung India. 2008;25:75-7.
10. Gill N, Velhal GD, Mahajan H, Sharma B. Treatment of tuberculosis in sero-positive patients in a tertiary care hospital and ART centre in Mumbai, India. Int J Med Health Sci. 2013;2(3):322-30.
11. Chennaveerappa PK, Siddharam SM, Halesha BR, Vittal BG, Jayashree N. Treatment outcome of tuberculosis patients registered at dots centre in a teaching hospital, south India. Int J Biol Med Res. 2011;2(2):487-9.
12. Acharya AS, Khandekar J, Jha C. Dots centre at a tertiary care teaching hospital in northern India: successes and challenges for the future. IJMS. 2012;3(1):21-5.
13. Mukhopadhyay S, Sarkar AP. Comparative analysis of RNTCP indicators in a rural and an urban tuberculosis unit of Burdwan district in West Bengal. IJCM. 2011;36(2):146-9.
14. Lisha PV, James PT, Ravindran C. Morbidity and mortality at five years after initiating category I treatment among patients with new sputum smear positive pulmonary tuberculosis. Indian J Tuberc. 2012;59:83-91.

Cite this article as: Bineni C, Yarasani P, Prabhu GR. A study on role of sputum conversion rate in management of tuberculosis in South Indian population. Int J Community Med Public Health 2018;5:1419-23.