

Evaluation of various factors influencing sputum smear positivity in newly diagnosed cases of pulmonary tuberculosis at a tertiary care centre of Bengaluru

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Abstract

Introduction: In a developing country like India tuberculosis (TB) is a common infectious disease diagnosed both in rural and in urban population. According to WHO (world health organisation) an open case of tuberculosis has at least three close contacts in their household resulting in prevalence rate of 2.5% among the close contacts. In the developing country it adds on to the economic burden. Many factors have been attributed to persistence of sputum positivity even at the end of intensive phase of TB treatment.

Objective: We conducted a retrospective study at our institution to identify the clinical, radiological and bacteriological factors of the patients influencing sputum conversion for AFB (acid fast bacilli) at the end of intensive phase (2 months) of anti-tubercular treatment in category 1.

Material and Methods: A retrospective Study was conducted at our institution from January 2016 to December 2017. Newly diagnosed open cases of TB were included in the study with retro viral cases being excluded from the study.

Results: Out of 179 cases in the study 103 cases were male and 86 cases were females. The predictive analysis and chi square test showed statistically significant association of smoking, cavity formation and degree of bacillary load and persistent sputum positivity.

Conclusion: Smoking, cavity formation and higher ABF load in the initial smears have higher possibility of persistent sputum positivity requiring more vigilant monitoring of such patients.

Keywords: Tuberculosis; Sputum positivity; Smoking; Cavity formation; Bacillary load.

Introduction:

In a developing country like India tuberculosis (TB) is a common infectious disease, diagnosed both in rural and in urban population. Several factors like poor diet, low socioeconomic status, and co-morbid conditions like diabetics, chronic smoking and alcohol consumption have been described to be associated with TB. A significant surge is seen with increasing incidence of HIV positivity and drug resistance. The initial evaluation of new open case of pulmonary TB and the re-evaluation at the end of intensive phase of treatment is critical in proper management of the patient and their categorisation. According to WHO (world health organisation) an open case of TB has at least three close contacts in their household resulting in prevalence rate of 2.5% among the close contacts [1]. In the developing country it adds on to the economic burden. Many factors have been attributed to persistence of sputum positivity even at the end of intensive phase of tuberculosis treatment [2]. The persistent sputum positivity not only results in poor patient outcome Identification of these factors will help in segregating patients requiring more vigilant surveillance [2].

Objectives:

We conducted a retrospective study at our institution to identify the clinical, radiological and bacteriological factors of the patients influencing

sputum conversion for AFB at the end of intensive phase (2 months) of category 1 anti-tubercular treatment.

Material and Methods:

A retrospective Study was conducted at Sapthagiri Institute of Medical Sciences and Research Centre from January 2016 to December 2017. After obtaining the ethical committee approval the records of newly diagnosed cases of pulmonary tuberculosis with sputum positivity for AFB (acid fast bacilli) and treated with category 1 anti-tubercular therapy with isoniazid, rifampicin, pyrazinamide and ethambutol were retrieved and included in the study. Retroviral positive cases were excluded from the study. A detailed clinical data were collected from the patient's records at the time of entry into study which included age, gender, history of smoking, chest X-ray and bacillary load in sputum positive smears. Following which data of the repeat sputum examination after 2 months of intensive phase therapy were documented. Using the clinical, radiological and bacteriological parameters included in the study in both persistent sputum positive and negative cases the predictive statistical analysis, odds ratio was calculated to identify the possible association of such factors with sputum positivity. The statistical significant of the result were tested using chi-square test.

Results:

A total of 2,325 patients had presented with chest symptoms presumptive of TB during the study period. On sputum smear examination 300 patients had been positive for tubercle bacilli. After 2 months of intensive phase therapy 121 cases had been lost on follow up either due to referral to other centres for treatment or as defaulters. Such cases had been removed from the study. 179 cases had been available for follow up with repeat sputum examination and were taken as our final study subjects. 26 cases (14.5%) out of 179 cases have shown persistent sputum positivity and 153 cases (85.5%) were negative for tubercle bacilli at the end of 2 months. Of the 179 cases, 103 cases were males (57.5%) and 76 cases (42.5%) were females. The age categorisation of the patient was as shown in Table 1. The clinical data including various parameters were compared in sputum positive and negative cases, and have been shown in Table 2. The odds ratio for males was 1.46 than for females. The p value was 0.38 being statistically insignificant at $p < 0.05$. The odds ratio for smoking is 66.6 than the non-smoker with 95% CI for

smoking being (2.95, 0.69). On chi-square test the chi-square value was 88.9 and was statistically significant with $p < 0.00001$ at $p < 0.05$. The odds for cavity formation on chest X-ray was 37.5 higher than no cavity formation with 95% CI being 0.56-2.58. On application of chi-square test the chi-square value was 66.11 and was statistically significant with $p < 0.00001$ at $p < 0.05$. The odds for degree of 3+ AFB load were 210 higher than lesser degree of bacillary load with 95% CI of 3.69-0.95. On testing with chi-square test the chi-square value was 112.8 and was statistically significant with $p < 0.00001$ at $p < 0.05$.

Table 1: Table showing age categorisation of the patients

Patient's age group	Number of cases
20-30	13
30-40	56
40-50	58
50-60	49
60-70	03

Table 2: Table showing clinical data including various parameters compared in sputum positive and negative cases

	Gender		Patients with history of smoking	Cavity formation on X ray	AFB Load on sputum examination		
	Male	Female			1+	2+	3+
Sputum positive cases	17	09	20	18	-	05	21
Sputum negative cases	86	67	08	10	116	33	04

Discussion:

The open cases of TB are a constant source of infection in the community. In a developing country like India TB adds to the socioeconomic burden of the country [3]. Identification of such high risk cases is essential in introducing strict vigilance so as to minimise spread of infection among the contacts and also hasten the process of smear negativity by monitored treatment. Thus it becomes essential to identify factors that influence the rate of smear conversion amongst the patients. Various studies are conducted to identify such factors [2,4]. In our study 14.5% of the patients showed persistent smear positivity for AFB after 2 months of treatment. Evaluation of the patient at the end of 2 months of treatment is essential as it decides on further categorization of the patient and to ascertain any change in the treatment protocol. Another Indian study has shown sputum conversion rate of 84% and 92% at the end of 2 months and 3 months respectively [5]. In our study we found more tuberculosis cases in the fourth decade of life. This data was not correlating with some of the studies who showed statistical correlation between increasing age and persistent sputum positivity [6]. In our study TB infection was found more in males who also had higher proportion of persistent sputum

positivity. This was probably because smoking was more common in males. This finding was consistent with the large population based study done by Zaman et al., in another developing country [7]. Similar results were also demonstrated by Feng et al., [8]. Smoking results in increased inflammatory process in the lungs resulting in damage to pneumocytes. It damages the cilia of the bronchioles and damages the innate immunity in lungs. Various studies had found delayed sputum conversion or non-conversion of sputum positivity among smokers [9,10]. However it also depends on intensity of smoking, whether patients stopped smoking after initiation of anti-tubercular treatment and effect of other confounding factors. The intensity of infection in the form of bacillary load and cavity formation in the lung also plays a major role in smear conversion. Various studies have also concluded similar results [11,12].

Conclusions:

We conclude that factors like smoking, cavity formation on X-ray and higher bacillary load during the initial assessment of the patient are associated with significant risk of persistent sputum positivity for AFB and such patients mandates a vigilant treatment monitoring.

Conflict of interest: Nil

Acknowledgment: Nil

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