



Impact of BCG Vaccination Status on Sputum Conversion Rate in New Sputum Positive cases of Pulmonary Tuberculosis

Authors

Priyam Goswami¹, Basanta Laskar², Jayanta Kumar Nath³

¹Assistant Professor of Medicine, Dept of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam India

²Professor of Medicine, Dept of TB & Chest Diseases, AMCH, Dibrugarh, Assam, India

³Post Graduate Trainee, Dept of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India

Email: priyam014@rediffmail.com, drblaskar@gmail.com, [jayantanath69@gmail.com](mailto:jayantnath69@gmail.com)

Abstract

Objectives: Sputum conversion rates (SCR) at the end of intensive phase of treatment of pulmonary tuberculosis varies and knowledge of factors involved is, inadequate. It has been reported that presence of a BCG scar was associated with greater rate of sputum conversion at the end of intensive phase (IP) of treatment. Hence, this study was undertaken with aim of studying the relationship between BCG vaccination status and sputum conversion rate in pulmonary tuberculosis (PTB) patients.

Materials And Methods: This was a hospital based observational study done at Assam Medical College and Hospital, Dibrugarh from July 2012 to June 2013. All new sputum smear positive (SSP-PTB) patients were put on antitubercular therapy under DOTS and followed up with repeat sputum microscopy at the end of intensive phase. A comparative study on the outcome was done between BCG scar positive and negative cases and statistical analysis done.

Results: All the 102 new SSP-PTB cases successfully completed intensive phase treatment under DOTS. Out of these 19 patients had to be put on extended IP of 1 month. BCG scar was present in 64.17% cases and absent in 35.29%. Overall, 81.37% of new sputum positive (NSP) cases converted at the end of second month IP on DOTS. In BCG scar present group, sputum conversion rate (SCR) was 90.90% whereas in scar absent group it was 63.89%, showing a significant 'p' value of 0.0013. In the extended IP group 94.48% cases with scar converted, while 22.22% without BCG scar remained non-converted with a significant 'p' value of 0.0009.

Conclusion: New SSP-PTB patients with evidence of previous BCG vaccination, show a significantly better sputum conversion rate at the end of intensive phase of DOTS.

Keywords: Pulmonary tuberculosis, BCG vaccine, Sputum conversion rate.

Introduction

Tuberculosis remains one of the major public health problems worldwide, particularly in the developing countries. India has the highest TB burden of the world accounting for one-fifth of global incidence.²

In India approximately 1.8 million cases are sputum smear positive (SSP) and responsible for transmission of disease. Early detection and effective treatment of SSP-PTB cases can cut down the chain of transmission.³ WHO emphasizes the

necessity of monitoring treatment by bacteriologic follow up examination in SSP-PTB patients. Sputum examination results at the end of two months intensive phase of treatment determines the next therapeutic regimen whether to go for continuation or extended intensive phase^{2,3}. Several studies have shown that persistent sputum positivity at the end of two months of ATT can predict adverse outcomes in terms of increased failure and/or relapse rates^{4,5}. Knowledge of factors associated with persistent sputum positivity at the end of two months of ATT may therefore be useful to the clinician to manage their patients better and improve outcomes

Several previous studies have identified factors such as pretreatment high sputum acid-fast bacilli (AFB) smear grading, gender, smoking, age, multiple cavitory lesions and low BMI as potential predictors of low sputum conversion^{4,6-10}.

Interestingly, it has been reported that the presence of a BCG scar was significantly associated with greater rate of sputum conversion at the end of intensive phase.¹ Hence, this study was undertaken with the objective of finding the BCG vaccination status of sputum positive patients on DOTS therapy under RNTCP and to study the relationship between BCG vaccination status and sputum conversion rate at the end of intensive phase (IP).

Materials and Methods

The present study was conducted in Assam Medical College and Hospital, Dibrugarh from July 2012 to June 2013. Permission was taken from the institutional ethics committee before carrying out the study. A total of 102 cases greater than 13 years of age and diagnosed as new smear positive PTB patients at DOTS Centre, Assam Medical College and Hospital and DTC, Dibrugarh attached to the department of TB & Chest Diseases were included in the study. Patients with known chronic liver disease, pregnant women, malignancy or immunosuppression, terminal illness were excluded from the study. Informed consent was taken from each patient.

All patients were subjected to a thorough clinical examination and data recorded in a prepared proforma. All 102 cases were enrolled in the first 9 months of study and another 3 months were kept for follow up. The results of pre-treatment sputum smear examination with Zeihl-Neelsen technique (2 samples) were recorded. All patients were put on DOTS therapy category I under RNTCP. Documentation of BCG scar for each NSP patient was done after examination of left upper arm. Presence of BCG scar was regarded as evidence of BCG vaccination. Patients were followed up with repeat sputum microscopy at 2 months. In 19 cases intensive phase had to be extended by another month according to RNTCP guidelines. Routine laboratory investigations were also done.

The data collected were analysed and statistical study done.

Results

All the 102 new SSP-PTB patients successfully completed intensive phase treatment under DOTS. Out of these 19 patients had to be put on extended IP for 1 month. There was a male preponderance of cases (59.80%) and maximum patients were in the age group of 13 -24 yrs (37.25%). Weight loss was the most common symptom (80.39%) followed by cough (73.53%) and fever (70.59%).

Table 1: Presenting symptoms

SYMPTOMS	NUMBER (n)	PERCENTAGE (%)
Weight Loss/Loss of Appetite	82	80.39
Cough	75	73.53
Fever	72	70.59
Dyspnoea	38	37.25
Night Sweats	35	34.31
Fatigue	29	28.43
Chest Pain	24	23.53
Haemoptysis	10	9.80

BCG scar was present in 64.71% cases and absent in 35.29%. In older age groups the non-vaccinated cases were more and highest between 13-25 years. It was observed that in more than half of the patients (53.92%) pretreatment sputum smear grading was high (3+) and maximum were in the age group of 35-44 years.

Table-2 : Relationship of BCG scar with sputum microscopy after 2 months of IP

Age Group (Yrs)	Bcg Scar Present				Bcg Scar Absent			
	Pretreatment cases		Conversion after 2 months		Pretreatment cases		Conversion after 2 months	
	n	(%)	n	(%)	n	(%)	n	(%)
13-24	30	45.45	26	86.61	8	22.22	4	50.0
25-34	21	31.82	19	90.47	8	22.22	5	62.5
35-44	11	16.67	11	100.0	7	19.44	4	57.14
≥45	4	6.06	4	100.0	13	36.11	10	76.9
TOTAL	66	100	60	90.90	36	100	23	63.89

'p' value – 0.0013

It was seen that at the end of 2 months IP SCR was 81.37% in all NSP cases. In the BCG scar present group SCR was 90.90% whereas in scar absent group it was 63.89%, showing a significant 'p' value of 0.0013 as shown in Table-2.

On evaluating data of conversion and non-conversion at the end of extended IP, it showed that 98.48% cases with scar converted, while 22.22% cases without scar did not convert having a significant 'p' value of 0.0009 (Table-3). In the initial high sputum grade (3+), BCG scar present group had 84.85% conversion whereas scar absent group had 45.45% conversion after 2 months of IP. A total of 9 cases (8.82%) remained positive even after extended IP, of which 1 case (11.11%) had a scar and 8 (88.89%) was without a scar.

Table-3: Showing BCG scar with sputum conversion rate after extended IP

Age Group (Yrs)	BCG Scar Present				BCG Scar Absent			
	Pretreatment Cases		Conversion after Extended IP		Pretreatment Cases		Conversion After Extended IP	
	n	(%)	n	(%)	n	(%)	n	(%)
13-24	30	45.45	30	100	8	22.22	5	62.50
25-34	21	31.82	20	95.23	8	22.22	7	87.50
35-44	11	16.67	11	100	7	19.44	5	71.43
≥45	4	6.06	4	100	13	36.11	11	84.62
Total	66	100	65	98.48	36	100	28	77.78

Hence analysis of data showed a significant association between BCG scar and sputum smear

conversion after both 2 months IP and end of extended IP.

Discussion

Tuberculosis remains as a leading cause of morbidity and mortality all over the world. A total of 102 cases of new sputum smear positive cases were studied.

In the present study most of the cases were observed between 13-24 years (37.25%) followed by the next group of 25-34 years (28.83%). In the first group male and female had equal incidence, but on advancement of ages male preponderance was noted. Age incidence in this study is closely related to similar study by Hans L Rider et al (1985) where highest incidence was observed between 25-29 years⁴. In another study by Tanzanian and British Medical Research Council in 1985 most of the patients were in the age group of 25-34 years¹¹.

In this study 59.8% cases were male and 40.2% cases female, the male female ratio being 1.48:1. Tanzanian and BMRC study also found a male preponderance with 64% males versus 36% females¹¹. Marcelo F Rabhi et al also found male preponderance which was similar to the present study¹². Current smokers were observed to be the most affected (53.92%) than past smokers and non-smokers. C Kuaban, R Barthe et al 2012 in their study observed that tobacco use was associated with persistent sputum positivity⁵.

In the present study, BCG scar was present in 64.7% of cases of which 60.66% were male and 70.73% cases were female. 78.95% patients in the 13-24 years age group were the highest vaccinated and the group of 45 years and above were the lowest vaccinated (25.53%). Colditz GA, Brewer TE et al (1994) 13 stated that BCG vaccine significantly reduces the risk of TB by 50% and age at vaccination did not enhance predictiveness of BCG efficacy. The present study showed similar results with Colditz et al.

Sputum conversion rate in PTB patients with adequate drug compliance is a potential indicator of treatment outcome. Non-conversion may lead to failure, default or drug resistance. In this study

overall SCR after 2 months of DOTS was 81.37% which increased to 90.10% after extended IP. The results are similar to that of the official report of District Tuberculosis Office, Dibrugarh. SCR for 2011 was 82% and 91% at end of 2 months and extended IP, and for the year 2012 it was 80% and 92% respectively. It was also found that 95.74% with low smear grade converted while only 69.09% cases of pre-treatment high sputum smear grade converted showing a significant 'p' value of 0.0006. Tiwari et al 2012, at National Tuberculosis Institute observed that SCR at the end of 2months IP was 57.9% in high positive grade and 71.6% among low positive group. After extended IP of 1month SCR was 85.2% and 92.3% respectively.

In this present study BCG scar present group showed 90.90% and 98.48% sputum conversion at the end of 2months and end of extended IP, in comparison to conversion of 63.80% and 77.77% in scar absent group. The protective effect provided by BCG vaccine as observed by different studies is very much heterogenous. Several trials show efficacy ranging from 0 to 80%. But studies showing BCG vaccination status and SCR are rare. In a study conducted by Kidolah Jeremiah et al on 754 culture positive PTB patients in 2006-2008 in Tanzania, it was shown that the presence of a BCG scar was found to be associated with a 43% lower risk of persistence of sputum smear positivity at the second month after initiation of anti-TB treatment. Moreover they also opined that PTB patients in absence of a BCG scar, male sex, high initial AFB sputum grading and low BMI are at risk of remaining culture and or sputum smear positive at the second month of ATT.

Conclusion

In conclusion, the new smear positive pulmonary tuberculosis patients with evidence of previous BCG vaccination, show a significantly better sputum conversion rate at the end of intensive phase of DOTS as well as the end of extended IP. Pre-treatment high smear grade cases without a BCG scar are found at significant risk of non-conversion at the end of IP. However, study in a large number

of cases over a wider geographical area need to be undertaken before coming to a conclusion in this respect.

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