

**Original article:**

**Comparative study on effect of various induction methods on sputum smear positivity**

Jethani S<sup>1</sup>, Kakkar R<sup>2</sup>, Semwal J<sup>3</sup>, Rawat J<sup>4</sup>, Ratwani K<sup>5</sup>

**Abstract:**

**Introduction:** Under RNTCP, the diagnosis of 25-30% tuberculosis cases with negative bacteriological report with radiographic evidence and with smear negativity due to inability to expectorate adequate amount of sputum are left untreated which ultimately increases the burden of tuberculosis. Such cases can be subjected to induction methods to improve yield of positive result in sputum. **Methodology:** Study was undertaken on all 538 patients who attended the Chest and Tuberculosis department in DOTS Microscopy centre of HIMS. Intervention was done only in those found smear negative but clinically and radiologically suggestive of pulmonary tuberculosis who gave written consent i.e. = 92 subjects (Chest Physiotherapy (N=92); Nebulization (N=92) & Broncho-alveolar lavage (N=14)). **Results:** Out 362 (67%) eligible subjects 228 were sputum negative, 92 patients gave consent for induction were subjected to chest physiotherapy for sputum induction of which 38 (41.3%) subjects came out to be sputum positive. Out of 92 patients subjected to nebulization for sputum induction 40 (43.4%) subjects yield sputum positive result. 14 patients were subjected to BAL (bronchoalveolar lavage) method to collect sputum sample of which 7(50%) came out to be sputum positive. (p=0.02). **Conclusion:** The non-invasive and cost effective methods of sputum induction should be incorporated more commonly in national programme as they provide better yield of sputum positivity.

**Keywords:** Pulmonary Tuberculosis; Sputum examination; RNTCP; DMC; cough duration; Yield; Induction

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**Introduction**

In our country since 1993, under implementation of the Revised National Tuberculosis Control Programme (RNTCP), the diagnosis of Pulmonary Tuberculosis is also primarily sputum based in accordance with the WHO guidelines. Each chest symptomatic is required to give two sputum specimens (first on the spot, second on next day early morning)<sup>1</sup>. To facilitate this requirement, one sputum testing centre have been established for 1,00,000 population in the community, and these microscopy centres have

been fully upgraded in terms of equipment and well trained staff<sup>2</sup>. Despite upgraded microscopic centres, there are 25-30% tuberculosis cases with negative bacteriological report. These bacteriological negative cases with high clinical suspicion can be subjected to induction methods to improve yield of positive result in sputum.

It has been found that patients with radiographic evidence and with smear negativity due to inability to expectorate adequate amount of sputum are left untreated which ultimately increases the burden of

1. Sumit Jethani, Assistant Professor, Deptt. of Community Medicine, North Delhi Municipal Corporation Medical College & HRH, Delhi-7
2. Rakesh Kakkar , Professor, Deptt. of Community Medicine, Himalayan Institute of Medical Sciences, SRH University, Swami Ram Nagar (Jolly Grant), Dehradun- 248140, Uttarakhand.
3. Jayanti Semwal, Professor,, Deptt. of Community Medicine, Himalayan Institute of Medical Sciences, SRH University, Swami Ram Nagar (Jolly Grant), Dehradun- 248140, Uttarakhand.
4. Jagdish Rawat, Professor, Deptt. of Chest & Pulmonary Medicine, Shri Guru Ram Rai Institute of Medical & Health Sciences, Dehradun- 248140, Uttarakhand.
5. Karuna Ratwani, Registrar,Obstetrics & Gynaecology,Apollo Hospital, New Delhi

**Correspondence to:** Dr. Rakesh Kakkar, Professor, Deptt. of Community Medicine, Himalayan Institute of Medical Sciences, SRH University, Swami Ram Nagar (Jolly Grant), Dehradun- 248140, Uttarakhand. India, E- mail:[drrakesh75@rediffmail.com](mailto:drrakesh75@rediffmail.com)

tuberculosis. Obtaining gastric washings, sputum induction done with hypertonic saline and fiberoptic bronchoscopy with bronchoalveolar lavage are established techniques for this indication, though these methods vary in their tolerability, safety and resource implications<sup>3,4</sup>. Sputum Induction is a safe and effective means of obtaining specimens for AFB smear and culture in persons suspected of having PTB but who cannot produce sputum spontaneously or who are smear-negative for AFB<sup>5</sup>. Therefore study was conducted to study effect of induction of sputum on smear positivity.

### **Methodology**

Study was undertaken on all patients in the age group of 18 years and above with history of cough for more than 2 weeks attending DOTS Microscopy centre of HIMS with or without other symptoms suggestive of tuberculosis attending DOTS Microscopy centre were included in study group. It comprised of all the patients who attended DOTS Microscopy centre of HIMS for a period of six months i.e. from 1<sup>st</sup> July to 31<sup>st</sup> December 2010. While patient below 18 year of age, very sick patients or person already on anti tuberculosis treatment were not taken as study subjects. Total patients attended the centre were 538 of which 362 (67%) were eligible subjects taken for the present study..

Sample patients were then subjected to two sputum samples collection on day-1 after informed consent in a following manner:

Routine on the spot sputum sample was collected from all study subjects i.e. 362. Then the subjects were distributed into two groups based on simple random selection through picking up of the chits. Group I subjects were asked to collect second sample after one hour, while group II subject were asked to collect sputum sample after two hours of 1<sup>st</sup> spot sample.

All the subjects were instructed to collect and submit early morning sputum sample on next day also.

The main tool for diagnosing pulmonary tuberculosis in the present study was sputum smear microscopy by collection of sputum and intervention done in those who were smear negative but clinically and radiologically suggestive of pulmonary tuberculosis (only those written consent) i.e. = 92 subjects, via

- i. Chest Physiotherapy (N=92)
- ii. Nebulization (N=92)
- iii. Broncho-alveolar lavage (N=14)

Intervention was done in form of induction through chest physiotherapy, Nebulised saline and broncho-alveolar lavage. The induction was done under supervision of trained medical personnel at department of Pulmonary Medicine.

The study was approved by the institute's ethics committee. Informed verbal consent was taken from all the patients included in the study. A separate written consent was also taken from the patients who underwent process of sputum induction. Study results were compared to establish if there is any added advantage on yield of sputum positivity after induction.

Data was processed on the software SPSS (version 17) and Microsoft excel 2007, Graph pad prism 5 and End Note program X5.

### **Limitations of study:**

Dehradun district has 20 DMC centres but for the study purpose centre at HIHT was chosen as it was more feasible and had facility for sputum induction. Induction by BAL could be done on limited number of subjects as it was an invasive procedure and needed additional written consent. Control group was not taken in the study.

### **Result:**

**Table 1: Sputum smear results by standard Regimen among Cough Symptomatic**

Regimens	Samples		Total (percentage)
	Positive	Negative	
Standard regimen	134(37.0%)	228(63.0%)	362(100%)

(Parenthesis given in bracket is percentage)

Sputum smear shows positive results only in 37 % cases while 63% remain sputum negative due to various reasons.

**Table 2: Comparison of sputum result (Post induction) and methods of Induction i.e. physiotherapy, nebulisation and BAL (Broncho-alveolar lavage)**

Result	Physiotherapy (N=92)	Nebulisation (N=92)	BAL (N=14)	P Test
Positive	38(41.3%)	40(43.4%)	7(50%)	P=0.02*
Negative	54(58.7%)	52(56.6%)	7(50%)	

(Parenthesis given in bracket is percentage)

VAL, bronchoalveolar lavage

Among 228 (62.9%) sputum negative subjects those who gave consent for various kinds of interventions were subjected for induction with the aim of increasing yield i.e. sputum positivity among those with high suspicion clinically for pulmonary tuberculosis but

are bacteriological sputum smear negative. Total of 92 patients were subjected to chest physiotherapy for sputum induction of which 38 (41.3%) subjects came out to be sputum positive.

Out of 92 patients subjected to nebulisation for sputum induction 40 (43.4%) subjects yield sputum positive result.

14 patients were subjected to BAL (bronchoalveolar lavage) method to collect sputum sample of which 7(50%) came out to be sputum positive. (p=0.02)

#### **Discussion:**

In the present study it was tried to investigate the diagnostic value of induced sputum and bronchial lavage specimens in patients with suspected pulmonary tuberculosis who had negative spontaneous sputum specimens. From 228 sputum negative subjects 92 were subjected to chest physiotherapy and Nebulisation to induce sputum of which 41.3% and 43.4% came out to be sputum positive in respective groups which was comparable to study done by L Saglam et al from January 2001-June 2003 at Turkey in which they reported 41.8% post induction sputum positivity for AFB and also by Marcus B Conde from 1996-98 at Brazil in which they reported 35% post induction sputum positivity for AFB<sup>5,6</sup>.

In present study only 14 sputum negative subjects has given consent (it's being a invasive procedure) for broncho alveolar lavage to collect sputum sample and 50% came out positive for AFB which was comparable to observations by L Saglam et al (47.3%) and Marcus B. Conde (40%).

In another study done by M C Williams et al on "Induced sputum and Bronchoscope in the diagnosis

of pulmonary tuberculosis" 50 cases were studied and 26 % cases were positive by Z-N staining after any means of sputum induction<sup>7</sup>. Hartung et al in their study "Sputum induction is simple diagnostic tool" studied 50 cases of which 29% cases were positive for AFB after sputum induction<sup>8</sup>.

A different method of induction was applied by K B Gupta and Seema Garg in a study done in January 2003 – Dec 2003 at Rohtak on 100 cases of suspected pulmonary tuberculosis who were initially found sputum negative. A safe, simple and cost effective way of induction with hypertonic saline delivered through ultrasonic nebulizer was used and it resulted in 38.15% positivity on induced sputum smear examination<sup>9</sup>.

#### **Conclusion:**

The non invasive and cost effective methods of sputum induction should be incorporated more commonly in national programme as they provide better yield of sputum positivity.

Various sputum induction methods have been useful in diagnosis of pulmonary tuberculosis and many a times can serve the purpose of diagnosing other d/s like Pneumocystis carinii pneumonias and lung carcinoma.

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**Conflict of interest-** Nil

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