

ORIGINAL ARTICLE

SAME DAY SPUTUM MICROSCOPY APPROACH FOR THE DIAGNOSIS OF PULMONARY TUBERCULOSIS IN A MICROSCOPY CENTRE AT A TERTIARY CARE HOSPITAL IN BAREILLY

Vijayesh Kumar Tiwari¹, Mohd. Javed Khan², Ankit Khurana², Amit Kumar³, Satyadeo Choubey³, Nadeem Akbar²

Author's Affiliations: ¹ Professor; ² Resident; ³ Assistant Professor, Department of Pulmonary Medicine, Rohilkhand Medical college and Hospital, Bareilly

Correspondence: Dr. Vijayesh Kumar Tiwari Email: vijayeshkiwari@gmail.com

ABSTRACT

Background: TB is major public health problem. Smear microscopy is the easiest, quickest and a reliable tool for the diagnosis of pulmonary tuberculosis. This requires two (spot and morning) sputum sample examinations over two days. Collection of two spot samples on same day increases the patient compliance.

Methods: we compared the yield of same day diagnostic and standard approach for the diagnosis of pulmonary tuberculosis.

Results: Out of 300 patients, same day approach could identify 67 cases, whereas standard approach could identify 70 cases.

Conclusion: Both the approaches are equally effective ($p > 0.05$).

Keywords: Diagnosis, Sputum smear microscopy, Tuberculosis

INTRODUCTION

Tuberculosis (TB) remains a major global health problem. TB is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (Pulmonary TB) but can affect other sites as well (extra pulmonary TB). The disease is spread in the air when people who are sick with pulmonary TB expel bacteria, for example by coughing and sneezing. It causes ill-health among millions of people each year and ranks as the second leading causes of death from an infectious disease worldwide, after the human immunodeficiency virus (HIV). The latest estimates including in this report are that there were 8.6 million new TB cases in 2012 and 1.3 million TB deaths. It affects mostly adults in the economically productive age groups.¹

Despite recent advances in rapid diagnostics, the most common method for diagnosis TB worldwide is sputum smear microscopy (developed more than 100 years ago), in which bacteria are observed in sputum samples examined under a

microscopy. Sputum smear microscopy has been the primary method for diagnosis of pulmonary tuberculosis in low and middle income countries.² It is a simple, rapid and inexpensive technique which is highly specific in areas with a very high prevalence of tuberculosis.² It also identifies the most infectious patients and is widely applicable in various population with different socio-economic levels.^{2,3,4} Hence, it has been an integral part of the global strategy for TB control. Due to the requirement of serial sputum examinations, some patients who do not come back for repeat sputum examination become "diagnostic defaulter".⁵ Earlier, most of the national TB control programmes (NTPs) diagnosed pulmonary tuberculosis by screening three sputum samples (spot-morning-spot (SMS) approach). This SMS approach would require 2 days time period. In SMS approach, most TB cases were diagnosed by the first two samples of sputum.⁶ So currently Pulmonary TB diagnosis is made by observing two sample of sputum (spot-morning scheme). This SM approach would also require 2 days time period as patients has to visit

the microscopy centre for 2 days. In SM approach patients has to spend a significant amount of money on travel etc. and also lost of working days.

So, an attempt was made to reduce the diagnosis defaulting by assessing the yield of same day sputum microscopy approach for the diagnosis of pulmonary tuberculosis.

Hence this study was conducted to compare the yield of same day diagnostic approach and standard approach for the diagnosis of pulmonary tuberculosis in terms of diagnostic accuracy. In our study, one more sample is collected after the first spot sample.

MATERIAL AND METHODS

This study was conducted in the Department of Pulmonary Medicine, Rohilkhand Medical College and Hospital, Bareilly. Rohilkhand Medical College is tertiary care teaching hospital with well equipped sate of the art infrastructure and well trained human resources. It caters mainly to the population of district Bareilly and adjoining areas.

This study was approved by institutional ethical committee. Informed written consent was taken from all subjects.

Source of data: A sputum was collected from 300 patients presenting with a complain of ≥ 2 weeks of cough and expectoration and age of 14 years and above were included in the study.

Sample collection: After collecting clinical history, the patients was explained the importance of submitting thick sputum rather than saliva. It was demonstrated that by taking three deep breaths, followed by a deep cough, a good quality sputum could be brought from the lungs.⁷ The Patients were explained to provide 5ml of sputum sample. Sputum sample were collected as per RNTCP guidelines. An additional sample was collected on day 1, one after the first sample as mentioned below.

1st sample (A): Spot sample on day 1, 2nd sample (B): One hour after 1st sample on day 1, 3rd sample (C): Early morning sample on day 2.

New unscratched slides were labeled with study number and used for smear preparation. The study was covered with wrap with around stickers before microscopy. Stickers were removed by different person entering the results.

Smear preparation: A new unscratched slide was selected for smear preparation. Smear was prepared with sterile loop. A good smear is spread

evenly, over a size of 2x3 cm and is neither too thick nor too thin. This was allowed to air dry for 15-30 min and fixed by passing it over a blue flame 3-4 times.⁸

ZN staining: As per RNTCP Manual for Laboratory Technicians.⁸

Statistical analysis: Proportion of positive sample was compared using chi square test of significance.

RESULTS

In our study, 300 patients were enrolled. Out of which, 212 were males (70.6%) and 88 (29.33%) were females. 148 (49.33%) belongs to a age group of 14-30 years followed by 124 (41.33%) belongs to 30- 50 years and 28 (9.33%) belongs to > 50 years age group. (Table1)

Case detected (positive rate) according to sample distribution is shown in table 2.

Table 1: Sociodemographic profile of study group (n=300)

Parameter	Patient (%)
Age group	
14-30 years	148 (49.33)
30-50 years	124 (41.33)
> 50 years	28 (9.33)
Sex	
Male	212 (70.60)
Female	88 (29.33)
Area of Residence	
Rural	213 (71.00)
Urban	87 (29.00)
Education	
Literate	77 (25.66)
Illiterate	223 (74.33)

Table 2: Case detected according to sample distribution

Sputum samples	Samples examined	Positive
A (Spot sample on Day 1)	300	65(21.6%)
B (one hour after 1st sample on Day 1)	300	67(22.3%)
C (early morning sample on Day 2)	300	70(23.3%)
p-Value 0.885		

Out of 300 patients, the standard approach could identify 70 cases whereas same day approach could identify 67 cases. Therefore only 3 patients were missed by same day approach. So, no statistical difference was found between two approaches ($p>0.05$). (Table 3)

Table 3: comparison of same day and standard approach

Approach	A,B (same day) (n=300)	A,C (Standard) (n=300)
Positive	67 (22.3%)	70 (23.3%)
P value 0.770		

DISCUSSION

Tuberculosis is a major public health problem and majority of infected individuals usually are below poverty line. Nearly 90% of TB cases occur in middle and low income countries.⁹ In these developing countries smear microscopy is the only diagnosis method to detect TB, as people can ill afford the rapid TB diagnostic tests. Sputum smear microscopy by ZiehlNeelsen staining remains the cornerstone of case detection for demonstrating acid fast bacilli but is associated with variable sensitivity in case detection and a high rate of diagnostic defaulters. If the total process could be completed and the result made available on the same day, it would reduce the number of visits and patient drop-out.

In our study, we have found that both same day approach and standard approach are equally effective for the diagnosis of pulmonary tuberculosis (p value > 0.05). In a multi-country randomized study on the diagnosis of TB, the participants were requested to submit sputum sample either by SMS or SSM scheme. IN this study, more number of patients in SSM scheme and no statistical difference have been shown with regard to sputum smear positivity.¹⁰ Chandra TJ et. al. (2012) found that the diagnosis of pulmonary tuberculosis is possible in one day by examining two spot samples.¹¹ S Hiraoet. Al. (2007) reported sputum positivity as 20% in SS2 scheme and 21% in SM scheme, and the difference was again statistically not significant.¹²

CONCLUSION

It was concluded from the present study that submission of two samples on same day with a gap of one hour was equally effective as standard approach. It would increase the patient's compliance and helps in reducing the diagnostic defaults.

REFERENCES

1. WHO Global report (2013). Available on Apps.who.int/iris/bitstream/10665/91355/1/9789241564656_eng.pdf.
2. Reider HL, Van Deun A, Kam KM, Kim SJ, Chonde TM, Trebucq A, Urbanczik R, editors. 68 boulevard Saint Michel, 750006, Paris, France: International Union Against Tuberculosis and Lung Disease; 2007. Priorities for tuberculosis bacteriology services in low-income countries.
3. Intentional Standard for tuberculosis Care.[accessed on March 6, 2013]. Available from: http://www.who.int/tb/publication/2006/istc_report.pdf.
4. Automated real Time Nucleic Acid Amplification Technology for Rapid and Simultaneous Detection of Tuberculosis and Rifamicin Resistance: Xpert MTB/RIF System. WHO Policy Statement. 2011. [Accessed on December 23, 2012]. available from http://whqlibdoc.who.int/publications/2011/9789241501545_eng.pdf.
5. Harries AD, Maher D, Nunn P. An approach to the problems of diagnosis and treating adult smear-negative pulmonary tuberculosis in high-HIV-prevalence setting in sub-Saharan Africa. Bull World Health Organ. 1998;76:651-62.[PMC free article] [PubMed]
6. Bonnet M, Ramsay A, Gagnidze L, Githui W, Gurin PJ, Varaine F. Reducing the number of sputum sample examined and thresholds for positivity: An opportunity to optimize smear microscopy. Int J Tuber Lung Dis 2007; 11: 953-8.
7. Mishal Sameer Khan, Osman Dar, Charalambos Sismanidis, Karam Shah, Peter Godfrey-Faussett. Improvement of tuberculosis case detection and reduction of discrepancies between men and women by simple sputum-submission instruction: a pragmatic randomized controlled trial. Lancet 2007; 369: 1955-60.
8. RNTCP Central TB Division. Manual for Laboratory Technicians. New Delhi, India: Directorate General of Health Services, Ministry of Health and Family Welfare, 1998. Available From: <http://www.tbcindia.org/LABMANUAL.pdf> [Last accessed date on 2013 Jan 22]
9. World Health Organization (2009) Global tuberculosis control: epidemiology, strategy, financing. Geneva. Available from: www.who.int/tb/publications/global-report/2009/pdf/full-report.pdf.
10. Cuevas LE, Yassin MA, Al-Sonboli N, Lawson L, Arbide I, et al. A Multi-Country Non-inferiority Cluster Randomized Trial of Frontloaded Smear Microscopy for the Diagnosis of Pulmonary Tuberculosis. PLoS Med 2011; 8(7):e1000443.
11. Chandra TJ. Same day sputum smear microscopy approach for the diagnosis of pulmonary tuberculosis in a microscopy center at Rajahmundry. India J Tuberculosis 2012;59:141-4
12. S. Hirao M.A. Yassin, H.G. Khamofu, L. Lawson, A. Chambanis, A. Ramsay and L. E. Cuevas. Sameday smear in the diagnosis of tuberculosis. Tropical Medicine and International Health 2007; 12 (12): 1459-63.