

**PREVALENCE OF PULMONARY TUBERCULOSIS IN HIV POSITIVE INDIVIDUALS AND ITS ASSOCIATION WITH CD<sub>4</sub> COUNT**Sudha Mishra<sup>1</sup>, Meena Mishra<sup>2</sup>, Atul R. Rukadikar<sup>3</sup>, A. M. Kurhade<sup>4</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: PURPOSE:** There is grave concern regarding increase in HIV associated Tuberculosis (TB) and emergence of Multi Drug Resistant (MDR) and Extremely Drug Resistant (XDR) TB. It is essential to know prevalence of TB in HIV patients and its association with CD<sub>4</sub> count. **MATERIAL & METHODS:** A total of 362 patients were screened for Pulmonary TB of which 85 (23.48%) were diagnosed as Pulmonary TB by radiology, Ziehl Neelson (ZN) smear and culture. Results: It was commoner in males (28.76%), almost equal in urban (23.64%) & rural (22.45%) people and more frequent in laborers (34.12%). Culture was positive in 34 (40%) out of 85 Pulmonary TB patients of which 33 were M. tuberculosis and one was Rapid grower. The results of the study emphasize that co-infection of TB in HIV/AIDS patients is a concern. There is direct correlation between CD<sub>4</sub> counts depletion and Pulmonary TB in HIV/AIDS patient. Hence, regular monitoring of these patients is warranted.

**KEYWORDS:** Pulmonary Tuberculosis, HIV, AIDS, CD<sub>4</sub> counts.

**INTRODUCTION:** AIDS, the Acquired Immunodeficiency Syndrome, is the disease known to be scourge for our century has had an impact like no other disease. Human Immunodeficiency Virus (HIV) affects the human Helper T lymphocytes and macrophages, which are important in maintaining cell mediated immunity (CMI). The CMI is essential in protecting persons from many diseases including tuberculosis. HIV is the most important known risk factor that promotes progression to active tuberculosis in people with Mycobacterium tuberculosis infection.<sup>1</sup> Tuberculosis (TB) and HIV have been closely linked since the emergence of AIDS. The lifetime risk of tuberculosis in immune competent persons is 5% to 10%, but in HIV positive individuals, there is a 5% to 15% annual risk of developing active TB disease.<sup>2</sup> The estimated prevalence of bacteriologically positive TB (Smear and/or culture) is 249 per 100,000 for India.<sup>3</sup> The pattern of clinical presentation of TB depends on the host immune status which is reflected in the microbiological, radiological and histological characteristics of TB.

The CD<sub>4</sub> T-cell count is one of the best indicators of the immediate state of immunologic competence of the patient with HIV infection. The appearance of many opportunistic infections correlates with the CD<sub>4</sub> count. TB generally develops at CD<sub>4</sub> counts of 200-500 cells/mm.<sup>3</sup> Thus determinations of CD<sub>4</sub> cell counts provide a powerful tool for determining prognosis and monitoring response to HAART.<sup>4</sup>

Therefore the present study has been undertaken to know the prevalence of Pulmonary Tuberculosis (PTB) in HIV positive individuals, to diagnose pulmonary tuberculosis in HIV positive individuals using conventional staining methods (Ziehl Neelsen stain), culture (Lowenstein-Jensen) and radiological evidence, and to study the correlation of pulmonary tuberculosis with the CD<sub>4</sub> cell counts in HIV positive individuals.

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**MATERIAL & METHODS:** The Prospective Hospital Based Study was conducted in the Department of Microbiology, from November 2007 to October 2009 in association with the ART clinic, Medicine, Integrated Counseling & Testing Centre, Chest and TB wards of our hospital.

A total of 362 known HIV positive patients of 18 years of age and above either hospitalized or coming to ART clinic, clinically suspected of having pulmonary tuberculosis, after written informed consent, were included in the study. The patients with extra pulmonary manifestations were excluded from the study.

Two sputum samples were obtained from each patient as per RNTCP guidelines.<sup>5</sup> Smears were prepared and stained by Ziehl Nielsen stain. The culture was done on Lowenstein-Jensen medium (LJ) The growth was identified by standard methods.<sup>6</sup>

About 3 ml of blood was collected from each patient using aseptic precautions in EDTA vacutainers. CD<sub>4</sub> counting of blood samples was done by Flow cytometry as per manufacturer's instructions (FACS Calibur, Becton-Dickinson, Immunocytometry system). The findings of the chest X-ray were noted of each patient. Correlation of CD<sub>4</sub> cell counts was done with the pulmonary tuberculosis in HIV positive patients.

**RESULTS:** Out of 362 patients, a total of 85 (23.48%) were diagnosed as Pulmonary tuberculosis patients by radiology, Z.N. staining and culture. The tuberculosis patients according to their occupation are shown in Table 1.

Of the 85 Pulmonary tuberculosis cases 34(40.0%) were positive by culture and/or smear along with radiology and 51 (60.0%) were diagnosed by radiology alone. Table 2 shows the correlation between the results of Z. N. stain and Culture.

Of the total 85 PTB cases, in 34 (40%) patients Mycobacteria were isolated by culture. Of the 34 isolates 33 were M. tuberculosis complex and 1 was Rapid grower (Atypical Mycobacteria). Of the 85 Pulmonary tuberculosis cases 48 (56.47%) had CD<sub>4</sub> counts of less than 200, in 28 (32.94%) between 200 & 349, in only 6 (7.06%) between 350 & 500 and in only 3 (3.53%) cases the CD<sub>4</sub> counts were more than 500 cells/ $\mu$ l. The association of CD<sub>4</sub> counts with occurrence of PTB is shown in Table 3.

**DISCUSSION:** AIDS is a pandemic of 21<sup>st</sup> century and pulmonary tuberculosis is the most common opportunistic infection (AIDSCAP).<sup>7</sup> it is important to identify PTB at an earliest so that it can be managed appropriately and at the right time. The prevalence of PTB among the HIV positive persons, in the present study is 23.48 per cent. The prevalence of co-infection with HIV varies widely across regions<sup>8,9,10,11,12,13</sup> within India and outside India mainly due to the variation in the distribution of risk factors, geographic location, awareness levels etc. of the study population.

In the present study, amongst these HIV/PTB co infected, as many as 29 (34.12%) were laborers by occupation followed by drivers 17 (20%). Thus laborers and drivers among AIDS patients had a significant association ( $p=0.023$ ) with the risk of developing TB. Moreover, TB is still a disease of the poor and the low socio-economic background particularly among the developing countries.

The diagnosis of PTB is based on Radiological findings supplemented by the microbiology tests. The Z. N. stain is simple, economical and rapid but culture is more sensitive than staining. Besides this, culture enables us to identify the strain and also to do the susceptibility testing. The culture isolates in the present study were mostly M. tuberculosis.

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The appearance of many opportunistic infections (OI's) correlates with the CD<sub>4</sub> cell count. In PTB patients to the depletion of CD<sub>4</sub> counts bear a direct correlation with acquisition of disease. Tuberculosis has a direct association with cell mediated immunity (CMI). The CD<sub>4</sub> counts are an important indicator of CMI status of an individual. The data in the present study indicates that the patients with CD<sub>4</sub> counts of less than 350/ $\mu$ l are at substantially higher risk of acquiring PTB. Similar correlation was reported by other Indian and foreign studies.<sup>14,15,16</sup> Since HIV/AIDS leads to immunosuppression, it is strongest of all known risk factors for development of TB. Thus, the patients who have CD<sub>4</sub> count <350 cells/ $\mu$ l have significantly more chances of acquiring TB (p=0.001) confirming further the importance of CD<sub>4</sub> counts.

Thus, the results of the present study emphasizes that co-infection of TB has been a major concern in HIV/AIDS patients. TB remains an important public health problem and has been exacerbated by the HIV epidemic, resulting in increased morbidity and mortality worldwide. HIV-TB co-infection is "Bidirectional and synergistic" and is often designated as "Cursed Duet". HIV/AIDS leads to immune suppression and is a strongest of all known risk factors for the development of TB and there is need for constant monitoring of HIV positive patients for acquisition of TB, assessment the type of prevalent mycobacteria in the region and information on the resistance pattern obtained in the prevalent strains.

Occupation	No. of patients (n)	No. of Tuberculosis patients (%)
Laborers	143	29 (34.12%)
Housewives	75	14 (16.47%)
Drivers	52	17 (20.0%)
Farmers	11	1 (1.18%)
Job	52	11 (12.94%)
Miscellaneous *	29	13 (15.29%)
<b>Total</b>	<b>362</b>	<b>85 (100%)</b>

Table 1: Prevalence of Tuberculosis in different occupations of HIV positive patients (n=362)

\*Salesman, Painter, Electrician, Welder Carpenter, Police Shopkeeper, Barber, Students, Hawkers etc.

ZN stain		Culture on LJ medium		Total (%)
		Positive	Negative	
	Positive	28	0	28 (7.73)
	Negative	6	328	334 (92.27)
	<b>Total (%)</b>	<b>34 (9.39)</b>	<b>328 (90.61)</b>	<b>362 (100)</b>

Table 2: Correlation between ZN staining and culture (n=362)

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<b>Counts: Cells/<math>\mu</math>l</b>	<b>HIV with PTB (%)</b>	<b>HIV without PTB (%)</b>	<b>Total (%)</b>
<200	48 (44.86)	59 (55.14)	107 (100)
200 – 349	28 (31.46)	61 (68.54)	89 (100)
350 – 500	6 (7.89)	70 (92.11)	76 (100)
>500	3 (3.33)	87 (96.67)	90 (100)
<b>Total</b>	<b>85 (23.48)</b>	<b>277 (76.52)</b>	<b>362 (100)</b>

**Table No. 3: Correlation of CD<sub>4</sub> count in HIV/PTB co infected cases**

### REFERENCES:

1. World Health Organization: Background information on tuberculosis and Human Immunodeficiency Virus: Impact of HIV on TB control. In: TB/HIV: A clinical manual/writing team: Harries A, Maher D, Graham S. 2nd ed. WHO.2004.
2. Swaminathan S, Ramachandran R, Baskaran G, Paramasivan CN, Ramanathan U, Venkatesan P et al: Risk of development of tuberculosis in HIV infected patients. *Int J Tuberc Lung Dis* 2000; 4:839-44.
3. World Health Organization: Global tuberculosis control: WHO Report 2010. <https://www.who.int/tb/publications/global.report>
4. Fauci AS, Lane HC. Human Immunodeficiency virus (HIV) disease: AIDS and related disorders. In: Harrison's Principles of Internal Medicine vol. 1. 16<sup>th</sup>ed. Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. Mc Graw Hill, New Delhi. 2005:1076-1139.
5. Central TB Division & National AIDS Control Organization: Training Module for Medical Officers on TB/HIV: Programme Objectives. NACO, New Delhi: 2005; 14-17.
6. Collee JG, Duguid JP, Fraser AG, Marmion BP, Simmons A: Laboratory strategy in the diagnosis of infective syndromes. In: Mackie and McCartney Practical Medical Microbiology-14<sup>th</sup> ed. Collee JG, Fraser AG, Marmion BP, Simmons A, editors. Elsevier (Churchill Livingstone), New Delhi. 2006; 53-94.
7. AIDS Control and Prevention (AIDSCAP) Project of Family Health Internal: The Status and Trends of the Global HIV/AIDS Pandemic. Final Report July 5-6. The Francois-Xavier Bagnoud Center for Public Health and Human Rights Of the Harvard School of Public Health, UNAIDS, 1996.
8. Dhungana GP, Ghimire P, Sharma S, Rijal BP: Tuberculosis co-infection in HIV infected persons of Kathmandu. *Nepal Med Coll J* 2008;10(2):96-9.
9. Saini A, Bajaj L, Ranjan R: Prevalence and clinico-radiological profile of TB in HIV seropositive patients. *Int Conf AIDS*. 2004 Jul 11-16; 15.
10. Maniar JK, Kamath RR, Mandalia S, Shah K, Maniar A: HIV and Tuberculosis: partners in crime. *Indian J Dermatol Venereol Leprol* 2006;72(4):276-82.
11. Chakraborty N, Mukherjee A, Santra S, Sarkar RN, Banerjee D, Guha SK et al: Current trends of opportunistic infections among HIV-Seropositive patients from Eastern India. *Jpn J Infect Dis* 2008; 61:49-53.

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12. Praharaj AK, Kalghatgi AT, Varghese SJ, Nagendra A: Incidence and Drug Susceptibility pattern of Mycobacterium tuberculosis in HIV infected Patients. MJAFI 2004; 60:134-36.
13. Mahajan A, Tandon VR, Verma S, Singh JB, Sharma M: Prevalence of tuberculosis, hepatitis B, hepatitis C and syphilis co-infections among HIV/AIDS patients. Indian J Med Microbiol 2008; 26:196-7.
14. Markowitz N, Hansen NI, Hopewell PC, Glassroth J, Kvale PA, Mangura BT et al: Incidence of tuberculosis in the United States among HIV-infected persons. Ann Intern Med 1997; 126:123-32.
15. Lee Man Po, Johnny Wai Man Chan, Ka Kui Philip Ng, Patrick Chung Ki Li: Clinical manifestations of tuberculosis in HIV-infected patients. Respirology 2000; 5:423-6.
16. Vajpayee M, Kanswal S, Seth P, Wig N: Spectrum of Opportunistic Infections and Profile of CD4+Counts among AIDS Patients in North India. Infection 2003; 31(5):336-40.

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