

Original Research Article

Clinical and laboratory profile of tuberculosis in HIV positive individuals

Sandhya Rani B.¹, Varsha R. Bhandarkar², Prathvi Nandalike¹, Machandra Reddy^{1*}

¹Department of Medicine, AIMS BG Nagara, Nagamangala, Mandya, Karnataka, India

²Department of Medicine, Saptagiri Institute of Medical Sciences, Bangalore, Karnataka, India

Received: 27 September 2022

Revised: 02 November 2022

Accepted: 08 November 2022

***Correspondence:**

Dr. Machandra Reddy,

E-mail: mreddy238@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Tuberculosis (TB), major public health problem in most of the developing countries. There is significant difference in the laboratory profile of tuberculosis in human immuno-deficiency virus (HIV) infected compared to immunocompetent host. Prompt diagnosis and treatment of tuberculosis in HIV infected will improve the morbidity and mortality associated with dual infection. Objectives of the research were: to study about the clinical profile of tuberculosis in HIV positive individuals; and also, to study about the laboratory profile of tuberculosis in HIV positive individuals.

Methods: Patients with HIV positive status who fulfill the inclusion and exclusion criteria and admitted in Adichunchanagiri hospital and research center, BG Nagara Mandya district, Karnataka India, during the period of January 2020 to June 2021.

Results: Fever was the most common symptom (92.8%). Most common manifestation was extrapulmonary TB (54%). TB meningitis was the most common extra pulmonary involvement seen in 28.67%. Amongst patients with pulmonary TB, 6.3% of cases were smear positive for AFB bacilli, 58% of cases had pulmonary infiltrates on chest X-ray. In all cases of extra pulmonary TB (EPTB) CD4T cell counts were <200 cells/μl.

Conclusions: Chest X-rays were atypical with more of lowerzone infiltrative lesions. Sputum acid-fast bacillus (AFB) is negative in most of the patients with pulmonary TB, however had sputum cartridge based nucleic acid amplification test (CBNAAT) positive status, hence sputum CBNAAT remains the gold standard investigation. Fluid analysis with ADA correlation holds good for the diagnosis of TB meningitis and tubercular pleural effusion.

Keywords: Acid fast bacilli; Directly observed treatment short course, Multi drug resistant tuberculosis

INTRODUCTION

Tuberculosis (TB) and human immune-deficiency virus (HIV) coinfection constitute the main burden of infectious disease in resource limited countries. In the individual host the two pathogens, *Mycobacterium tuberculosis* and HIV potentiate one another accelerating the deterioration of immunological functions and resulting in premature death if untreated.

Both TB and HIV have profound influence on immune systems as they are capable of disarming the host's immune response through mechanism that are not fully understood.

TB is the commonest opportunistic infection in HIV infected individuals.¹ Global TB report by World Health Organization (WHO) estimates 1.3 million deaths by TB in 2017 in HIV negative individuals and additional 300000 deaths among HIV positive individuals.²

The incidence of tuberculosis in India was approximately 28,00,000 accounting for about a quarter of the world's TB cases.³ Some 14 million individuals worldwide are estimated to be dually infected.⁴ TB is the largest single cause of death in setting of AIDS, accounting for about 32% of AIDS related deaths, 99% of which occur in developing countries.⁵ The life time risk of breaking down to disease among those infected with TB is 10–15% which gets increased to 10% per year amongst those co-infected with HIV.⁶ Other determinants such as diabetes mellitus, smoking tobacco products, alcohol abuse and malnutrition also increase the risk of progression from infection to TB disease.

In many parts of the world, many studies had mentioned susceptibility of HIV patients to develop extrapulmonary TB.⁷⁻¹⁰

It is found that in India about 5% of TB patients registered under Revised National TB Control Programme (RNTCP) also have HIV infection.⁵ In contrast to HIV infection, infection with *M. tuberculosis* can be spread via respiratory droplets and close non sexual contacts.

The current Centers for Disease Control and Prevention (CDC) classification categorizes patients on the basis of clinical conditions and CD4+ T-lymphocyte counts.¹¹

The absence of cavitations and combined pulmonary and extra pulmonary disease are seen in more often in patients with lower CD4 counts.¹² This epidemic of tuberculosis probably represents, the greatest health risk to general public and also health care personnel dealing with these patients. So, prompt diagnosis and treatment of tuberculosis in HIV infected will improve the morbidity and mortality associated with dual infection. Hence the study was conducted to determine the clinical and laboratory profile of TB in HIV infected in relation to CD4 counts.

METHODS

Source of data

Patients with HIV positive status who fulfill the inclusion and exclusion criteria and admitted and undergoing treatment in Adichunchanagiri Hospital and Research Center, AIMS BG Nagara Mandya district, Karnataka, India, known HIV patients attending anti-retroviral treatment centre for follow up during the period of January 2020 to June 2021.

Method of collection of data

Sample size

100 at 5% level of significance, taking p-proportion of coinfection in hospitals as 3.5 with absolute error of 5% (prevalence of HIV positive patients-6571, prevalence of HIV-TB coinfection-228).

Sampling method

Simple random sampling was used.

Type of study

It was a cross sectional study.

Data analysis

Data analysis was done by calculating mean, proportion and standard deviation.

Inclusion criteria

HIV positive patients with and without ART diagnosed with symptoms of pulmonary or extrapulmonary TB with age >18 years were included in the study.

Exclusion criteria

Patients with other immune compromised states were excluded from the study.

Investigations

Complete blood count and erythrocyte sedimentation rate (ESR), sputum smears microscopy by Zeil-Neelson staining for acid fast bacilli (ACB); sputum culture and sensitivity; chest radiograph; ultrasonography (USG) abdomen; CBNAAT; CD4 count; funduscopy; and ADA.

If relevant, the following investigations were also done: fine needle aspiration cytology (FNAC) of lymph nodes, X-ray spine AP and lateral, computed tomography (CT) brain, and contrast enhanced CT-abdomen.

Sample size estimation

111 at 5% level of significance, taking p-proportion of coinfection in hospitals as 3.5 with absolute error of 5%. Prevalence of HIV positive patients – 6571, prevalence of HIV-TB coinfection – 228.

RESULTS

In this study 111 patients were studied, out of which 32 were females and 79 were males.

The mean age of the study group- males 43 years and females 38.8 years. Majority of the patients was in the age group of 36-45 years (Table 1).

Among the study population 19 (22%) patients had upper zone chest X ray (CXR) infiltrations, 29 (58%) had mid/lower zone infiltrations, 1 (2%) had fibrocavitary changes in CXR (Table 3).

Table 1: Age-wise and sex-wise distribution.

Age group (years)	Sex		Total
	Male	Female	
18-25			
Number	2	2	4
Percentage	2.5	6.2	3.6
26-35			
Number	23	12	35
Percentage	29.1	37.5	31.5
36-45			
Number	24	11	35
Percentage	30.4	34.4	31.5
45+			
Number	30	7	37
Percentage	38.0	21.9	33.3
Total			
Number	79	32	111
Percentage	100.0	100.0	100.0
Mean age (years)	43.2278	38.8125	

Table 2: Clinical features.

Parameters	Number of patients	Percentage
Fever	103	92.8
Weight loss	79	71.2
Reduced appetite	103	92
Breathlessness	11	9.9
Cough	79	71.2
Hemoptysis	4	3.6
Neck swelling	7	6.3
Seizure	4	3.6
Hemiparesis	6	5.4

Table 3: X-ray.

Lesions	Upper zone (%)	Middle/lower zone (%)
Infiltrative	19 (22)	29 (58)
Fibrocavitary	1 (2)	-

Out of the total (50) patients with pulmonary tuberculosis, 7 (6.3%) were sputum AFB positive and 43 (86%) were sputum AFB negative (Table 4).

Table 4: Sputum.

Sputum	Number of patients	Percentage
AFB +ve	7	14
AFB-ve	43	86
Total	50	100

In this study, majority of the patients were in the CD4 group 50-200-79 (71.2%). Next is >200 – 20 (18%), <50-1 (10.8) (Table 5).

Table 5: CD4 counts and number of patients.

CD4 counts	Number of patients	Percentage
<50	12	10.8
50-200	79	71.2
200+	20	18.0
Total	111	100.0

Table 6 depicts mean CD4 count and different manifestation of tuberculosis, 2 patients with CD4 <50 had pulmonary TB, whereas 10 patients with CD4 <50 had extra pulmonary TB, 38 patients with CD4 50-200 had pulmonary TB, whereas 41 patients with CD4 50-200 had extra pulmonary TB, among patients with CD4 >200 10 had pulmonary TB and 10 had extra pulmonary TB.

Table 6: Mean CD4 count and different manifestation of tuberculosis.

Tuberculosis	CD4 counts			Total
	<50	50-200	200+	
Pulmonary TB				
Number	2	38	10	50
Percentage	4.0	76.0	20.0	100.0
Extra pulmonary TB				
Number	10	41	10	61
Percentage	16.4	67.2	16.4	100.0
Total				
Number	12	79	20	111
Percentage	10.8	71.2	18.0	100.0

Out of 49 patients with pulmonary TB, 6 patients with AFB positivity had upper zone involvement whereas 1 patient had lower zone involvement (Table 7).

Table 7: Sputum positivity with X-ray zone involvement.

Sputum	Upper zone	Middle/lower zone
AFB positive	6	1
AFB negative	12	29

DISCUSSION

In this study out of 111 people studied, 79 (71%) are males and 32 (28%) are females, this is comparable to study by Boorsu et al, where 68% were males and 31% were females.¹⁴

Most of the people were in the age group 45 and above 33.33%, mean age of males being 41, mean age of females being 38, this is comparable to study by Boorsu et al where mean age is 39.4.¹⁴

Most common clinical symptom is fever (92.8%), and common respiratory symptom is (71.2%).

Table 8: Comparison of symptoms with other studies.

Symptoms	Present study	Singhal et al ¹³	Patel et al ¹⁵
Fever	92.8	78	86
Weight loss	71.2	56	78
Reduced appetite	92.8	50	61
Cough	71.2	75	96
Breathlessness	9.9	62	56
Hemoptysis	3.6	10	14

Symptoms are comparable with almost all studies, wherein the most common constitutional symptom being fever, and most common respiratory symptom being cough.

In the current study, the incidence of pulmonary TB was found to be 45%, this is comparable to study conducted by Singh et al which had an incidence of 51%, whereas few other studies done by Patel et al and Ahmed et al, the incidences were 86% and 80% respectively.^{13,15,16}

Amongst the cases of pulmonary TB, sputum positivity for AFB was seen in 14% of patients, whereas in study done by Patel et al, it was found to be 25.8%, and study by Ahmed et al, its 37%, the probable reason for less sputum positivity in the current study could be because of low mean CD4 count.^{15,16} The situation in HIV uninfected tuberculosis patients is very different from this and indicates sputum smear is not a sensitive diagnostic tool in the presence of HIV infection.

Table 9: Comparison of X-ray findings with other studies.

Studies	Upper zone (%)	Mid/lower zone (%)	Fibro-cavitary (%)
Present study	22	58	2
Singhal et al¹³	27	55.5	3.7
Ahmed et al¹⁶	67	37	28

The X-ray features are comparable with the study done by Singhal et al, where in the involvement of middle and lower zones are more than upper zones, this is probably because of the level of immunosuppression as majority of study group patients have a CD4 count <200/microl.

Out of 111 patients studied, 50 (45%) had pulmonary TB, remaining 61 (54.9%) had extrapulmonary TB.

The most common extra pulmonary manifestation in present study is TB meningitis followed by pleural effusion, whereas the other studies have TB lymphadenopathy as most common manifestation. Extrapulmonary TB is more common in HIV/TB coinfection, especially with advanced immunosuppression than in non-HIV/TB coinfection.

Table 10: Comparison of extrapulmonary manifestation of TB with other studies.

Parameters	Present study (%)	Ahmed et al ¹⁶ (%)	Boorsuet al ¹⁴ (%)
TB meningitis	31.5	1.54	14.67
TB pleural effusion	13.5	13	12
TB lymph-adenopathy	5.4	17.2	28.6
Abdominal TB	4.5	0.7	23.26

The mean CD4 count in the present study is 162 cells/microl, the majority of patients were in the group having CD4 of 50-200 (79%), >200 (20%), <50 (12%) CD4 level is one of the parameters to determine the stage of HIV infection that represent degree of immunity deficiency. Various studies have shown high mortality rates in HIV-infected TB patients in resource-limited settings. HIV infection increases the risk of acquiring TB, alters the clinical presentation of TB and reduces overall survival. High mortality rates in these patients have been attributed to severe immunosuppression as measured by CD4+cell count, and to lack of antiretroviral therapy (ART)¹⁷

Limitations

Study with larger sample size is required to improve accuracy. Also, the study centre, being a tertiary care referral care might have led to the increased percentage of extrapulmonary tuberculosis as compare to pulmonary TB.

CONCLUSION

In this study, the most common manifestation of tuberculosis in HIV positive individual is extra pulmonary tuberculosis (54.5%), most common amongst it is TB meningitis, and pulmonary tuberculosis forming 45%, most of the patients with pulmonary TB were sputum AFB negative.

The most common constitutional symptom being fever, and most common respiratory symptom being cough.

CD4 counts correlated with severity, that is when CD4 counts are low, more of sputum negative and extra pulmonary TB are manifested. Chest X-rays were atypical with more of lowerzone infiltrative lesions and less no. of cavitatory lesion. So, a high level of clinical suspicion is required to diagnose tuberculosis in HIV, especially when CD4 count is less than 200.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Narain JP, Raviglione MC, Kochi A. HIV associated tuberculosis in developing countries: Epidemiology and strategies for prevention. *Tuberc Lung Dis.* 1992;515-26.
2. WHO/Global Tuberculosis report 2017. 20th report. Switzerland. 2017. Available at: <https://apps.who.int/iris/handle/10665/259366>. Accessed on 24 October 2022.
3. Ministry of Health and Family Welfare. India TB report. RNTCP annual status report. New Delhi. 2018. Available at: <https://tbcindia.gov.in/index1.php?lang=1&level=1&sublinkid=4160&lid=2807>. Accessed on 24 October 2022.
4. Getahun H, Gunneberg C, Granich R, Nunn P. HIV infection associated tuberculosis: The epidemiology and the response. *Clin Infect Dis.* 2010;50(3):S201-7.
5. Corbett EL, Watt CJ, Walker N, Maher D, Williams BG, Raviglione MC, Dye C. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Arch Intern Med.* 2003;163:1009-21.
6. Tripathy S, Menon P, Joshi DR. Preliminary observation on lymphocyte subpopulations in HIV positive and HIV negative tuberculosis patients in Pune, India. *Indian J Med Res.* 2000;111:195-8.
7. Corbett E, Marston B, Churchyard GJ, De Cock KM. Tuberculosis in Sub-Saharan Africa: Opportunities, Challenges, and Changes in the Era of Antiretroviral Treatment. *London School of Hygiene and Tropical Medicine.* 2006;367:926-37.
8. Dean GL, SG Edwards, NJ Ives, Gail M, EF Fox, Lesley N et al. Treatment of Tuberculosis in HIV-infected Persons in the Era of Highly Active Antiretroviral Therapy. *AIDS.* 2002;16:75-83.
9. Forssbohm M, Zwahlen M, Loddenkemper R, Rieder HR. Demographic Characteristic of Patients with Extrapulmonary Tuberculosis in Germany. *Eur Respir J.* 2008;31:99-105.
10. Harrison's textbook of internal medicine, 20th ed. McGraw-Hill Inc. 2018;1357.
11. Swaminathan S, Sangeetha M, Arun Kumar N. Pulmonary Tuberculosis in HIV positive individuals. *Ind J Tub.* 2002;49:189.
12. Singhal M, Gupta NK, Kanwaria DK. Clinical Spectrum of Tuberculosis (Pulmonary, Extra Pulmonary and Disseminated) in HIV Patients and Its Relationship With Cd4 Counts. 2017;16(6):75-7.
13. Kandati J, Boorsu SK, Pathalapati R, Buchineni M. Bleached smear microscopy provides higher yield in diagnosing pulmonary tuberculosis. *Int J Res Med Sci* 2016;4:2193-6.
14. Anand K Patel, Sandip J Thakrar, Feroz D Ghanchi, Clinical and laboratory profile of patients with tb and hiv coinfection. *Lung India.* 2011;28:93-6.
15. Jaryal A, Raina R, Sarkar M, Sharma A. Manifestations of tuberculosis in HIV/AIDS patients and its relationship with CD4 count. *Lung India.* 2011;28(4):263-6.
16. Nzou C, Kambarami R, Onyango F, Ndhlovu C, Chikwasha. Clinical Predictors of Low CD4 Count Among HIV-Infected Pulmonary Tuberculosis Clients: A Health Facility-Based Survey. *S Afr Med J.* 2010;100:602-5.

Cite this article as: Sandhya RB, Bhandarkar VR, Nandalike P, Reddy M. Clinical and laboratory profile of tuberculosis in HIV positive individuals. *Int J Res Med Sci* 2022;10:2850-4.