

A Study to Evaluate Development of Tuberculosis and its Correlation with CD4 + T Lymphocytes Count in Newly Diagnosed People Living with HIV AIDS Attending Tertiary Art Centre at Maharaja Yeshwantrao Hospital Indore

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Abstract

Background: Tuberculosis (TB) is the most common opportunistic infection among HIV-infected patients, who remain at high risk for TB throughout the course of their disease. In this study, we evaluated the development of TB and its correlation with CD4 + lymphocyte count in newly diagnosed People Living with HIV AIDS (PLHA).

Material and Methods: The present study was conducted at the Tertiary AntiRetroviral therapy center and Department of Medicine, Maharaja Yeshwantrao Hospital, Indore during the period January 2019 to July 2020. We had screened 1610 patients with PLHA. Of these 1610, 200 patients were diagnosed with TB. All these patients fulfilled the inclusion criteria and none of the exclusion criteria and those who were willing to provide their voluntary written informed consent were enrolled.

Results: Of 200 TB-HIV patients 75 (37.5%) had pulmonary TB and 125 (62.5%) had extrapulmonary involvement. Out of 125 cases of extrapulmonary TB in 57 (45.6%) patients there was Koch's abdomen, in 48 (38.4%) patients there was lymph node TB, in 10 (8%) patients there was pleural effusion, and in 10 (8%) patients tubercular meningitis was seen.

Conclusion: Our study supports the findings that as CD4+ T lymphocytes count decreases, the risk of development of TB is increases. Therefore screening the HIV/AIDS patients for co-infections, TB should be definitely included in the study.

Key words: Tuberculosis, Opportunistic infection, People living with HIV AIDS, Tubercular meningitis

INTRODUCTION

Tuberculosis (TB) is the most common opportunistic infection among HIV-infected patients, who remain at high risk for TB throughout the course of their disease.^[1] TB is the most important cause of morbidity and mortality

in People Living with HIV (PLHIV).^[2] India is the third-highest HIV burden country in the world, with an adult prevalence of 0.22%. By numbers, India ranks 2nd in the world and accounts for about 9% of the global burden of HIV-associated TB.^[3] PLHIV are 20–21 times at higher risk of developing TB. TB-HIV co-infection results in higher mortality rates and nearly 25% of all deaths among PLHA are due to TB. In India, about 110,000 people are estimated to be HIV-TB co-infected annually, with the national average for HIV prevalence among incident TB cases at 5%. The mortality in this group is very high and 9700 people die every year among TB/HIV co-infected patients.^[4-6]

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The HIV virus damages the body's natural defences - the immune system and accelerates the speed at which TB progresses from a harmless infection to life-threatening condition. The estimated 10% activation of dormant TB infection over the life span of an infected person, is increased to 10% activation in 1 year, if HIV infection is superimposed TB is already the opportunistic infection that most frequently kills HIV-positive people. Even in HIV positive cases, TB can be cured if diagnosed in time and treated properly.^[4,5]

To mitigate the effect of dual burden of HIV and TB, Revised National TB Control Programme and National AIDS Control Programme have developed a collaborative framework. Via Single window delivery of TB and HIV services is being successfully implemented for all PLHIV in the AntiRetroviral therapy (ART) centers, wherein intensified case-finding through screening all ART center attendees for TB, offering rapid molecular testing to symptomatic patients and providing anti- TB treatment.^[4,5]

MATERIALS AND METHODS

This prospective and observational study was conducted at the Tertiary ART center and Department of Medicine, Maharaja Yeshwantrao (M.Y.) Hospital, Indore during the period January 2019 to July 2020. We had screened 1610 patients with PLHA. Of these 1610, 200 patients were diagnosed with TB.

Study Centre

Tertiary ART Center and Department of Medicine, M.Y. Hospital, Indore, Madhya Pradesh.

Study Design

Prospective observational study.

Methodology

The patient and/or his/her legally acceptable representative were explained about the study in detail including the procedures, risks/benefits, etc. After obtaining their verbal approval for participation in the study, a voluntary written informed consent was obtained from them for participation in the study. All the study-related procedures were carried out after obtaining the consent.

A detailed medical history including the presenting complains, history of any chronic medical illness, surgical history, history of drug treatment, family history of chronic medical illness or any familial surgical history were obtained. The personal history included diet, sleep, bowel, and bladder patterns.

The patient underwent general and systemic examinations. Following which blood samples were collected for

routine laboratory investigations, which included CD+T lymphocyte counts.

Ethical Considerations

This study was approved by the institutional ethical committee and review board.

Statistical Analysis

The data were initially entered into the Microsoft Excel for analysis. Online statistical software such as GraphPad, and Epi Info. were used for calculating the p values. Comparison of means between the groups was done using Unpaired “t”-test and within the group was done using Paired “t”-test. Association between two non-parametric variables was done using the Pearson Chi-square test. $P < 0.05$ was taken as statistically significant. The final data were presented in the form of tables and graphs.

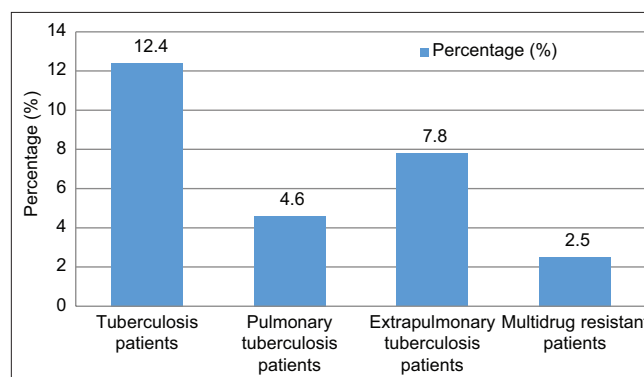
RESULTS

As shown in Table 1 and Graph 1, a total of 1610 patients were enrolled in this study. Of these 1610 patients, 200 (12.4%) patients had TB, out of those TB patients, 75 (4.6%) patients had pulmonary TB and 125 (7.8%) patients had extrapulmonary TB.

As shown in Table 2, in 57 (28.5%) patients there was Koch's abdomen, in 48 (24.0%) patients there was lymph node TB, in 10 (5.0%) patients there was pleural effusion,

Table 1: Distribution of patients

Category	No. of patients	Prevalence
Total PLHIV patients at tertiary ART centre and M.Y. Hospital, during the study period	1610	
Tuberculosis patients	200	12.4%
Pulmonary tuberculosis patients	75	4.6%
Extrapulmonary tuberculosis patients	125	7.8%



Graph 1: Bar diagram showing distribution of patients

in 75 (37.5%) patients pulmonary TB was seen and in 10 (5.0%) patients tubercular meningitis was seen.

Majority of the patients had pulmonary TB followed by Koch's abdomen and lymph node TB.

As shown in Table 3 and Graph 2, in 32 (16.0%) patients the CD4+ count was between 200 to 500, in 119 (59.5%) patients it was between 100 and 199, in 37 (18.5%) patients it was between 50 and 99 and in 12 (6.0%) patients it was <50. The mean CD4+ count in our study was 195.26 ± 104.59 .

As shown in Table 4 and Graph 3, the mean CD4+ count in extrapulmonary TB was 195.75 ± 105.38 and in the pulmonary TB was 194.44 ± 103.96 . The difference was found to be statistically not significant ($P = 0.932$), showing

a comparable mean CD4+ count between the pulmonary and extrapulmonary TB patients.

As shown in Table 5 and Graph 4, the mean CD4+ count in Koch's abdomen was 136.79 ± 49.21 , in lymph node it was 146.04 ± 62.92 , in pleural effusion it was 170.80 ± 64.81 , in pulmonary TB it was 155.11 ± 69.96 and in tubercular meningitis it was 69.90 ± 36.20 . The comparison of mean CD4+ counts in relation to type of TB was found to be statistically significant (F value = 4.952, $P = 0.001$), showing that the mean CD4+ count across all the types of TB is varying.

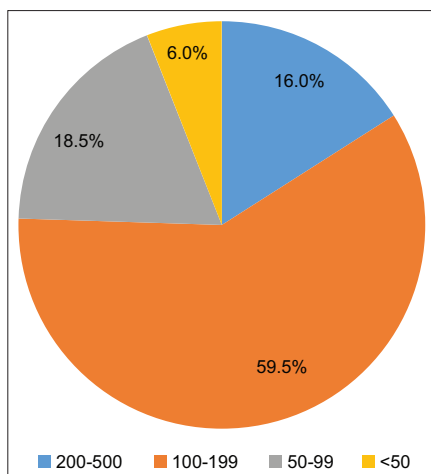
The CD4+ count was highest in pleural effusion and lowest in tubercular meningitis.

Table 2: Distribution of patients according to tuberculosis type

Tuberculosis type	Number	Percentage
Koch's abdomen	57	28.5
Lymph node	48	24.0
Pleural effusion	10	5.0
Pulmonary tuberculosis	75	37.5
Tubercular meningitis	10	5.0
Total	200	100.0

Table 3: Distribution of patients according to CD4+ count

CD4+ count	Number	Percentage
200-500	32	16.0
100-199	119	59.5
50-99	37	18.5
<50	12	6.0
Total	200	100.0



Graph 2: Pie diagram showing distribution according to CD4+ count

Table 4: Comparison of mean CD4+ count in relation to pulmonary and extrapulmonary tuberculosis

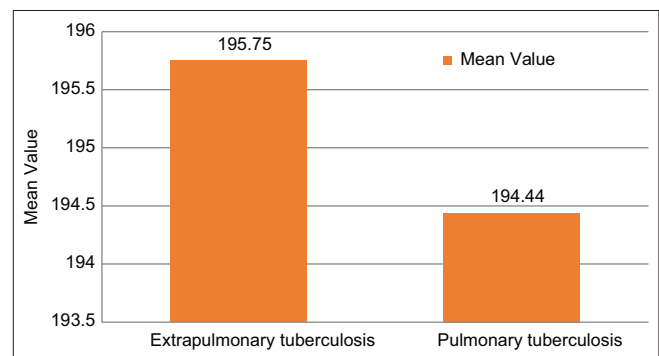
Group	No.	Mean±SD	"t"-value	P value
Extrapulmonary tuberculosis	125	195.75±105.38	0.086, df=198	0.932, NS
Pulmonary tuberculosis	75	194.44±103.96		

Unpaired "t"-test applied. $P=0.932$, Not significant

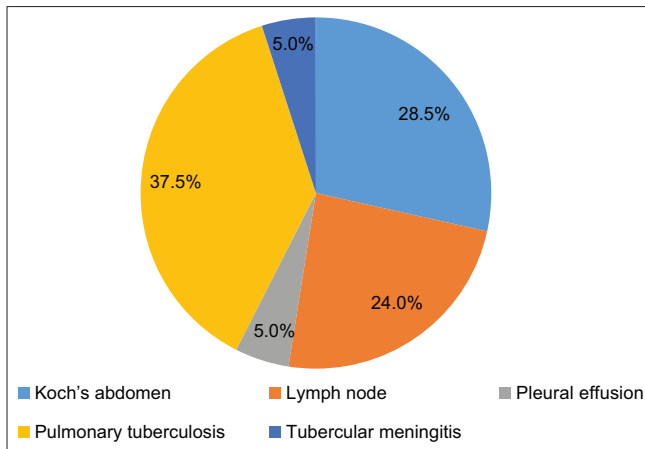
Table 5: Comparison of CD4+ counts in relation to type of tuberculosis

Type of Tuberculosis	Number	CD4+	F value	P value
Koch's abdomen	57	136.79±49.21	4.952	0.001*
Lymph node	48	146.04±62.92		
Pleural effusion	10	170.80±64.81		
Pulmonary tuberculosis	75	155.11±69.96		
Tubercular meningitis	10	69.90±36.20		

*Significant level, P value < 0.05



Graph 3: Bar diagram showing comparison of mean CD4+ count between pulmonary and extrapulmonary tuberculosis



Graph 4: Pie diagram showing distribution according to type of tuberculosis

37 (18.5%) patients it was between 50–99 and in 12 (6.0%) patients it was <50. The mean CD4+ count in our study was 195.26 ± 104.59 .

The mean CD4+ count in Koch's abdomen was 136.79 ± 49.21 , in lymph node it was 146.04 ± 62.92 , in pleural effusion it was 170.80 ± 64.81 , in pulmonary TB it was 155.11 ± 69.96 and in tubercular meningitis it was 69.90 ± 36.20 . The comparison of mean CD4+ counts in relation to type of TB was found to be statistically significant (F value = 4.952, $P = 0.001$), showing that the mean CD4+ count across all the types of TB is varying.

Leeds *et al.* (2012)^[7] collected data from the medical records of patients with extrapulmonary TB. Of these 320 patients, 150 (48.1%) patients had HIV infection and 40% had concomitant pulmonary TB. They found in patients of HIV infection with low CD4+ counts (<100), CNS/meningeal and/or disseminated type of TB was the more common.

Dias *et al.* (2016)^[8] included 112 patients to study the prevalence of extrapulmonary TB in HIV patients and to relate them to the immune status and final outcome. They found that the mean CD4+ count was lowest in the meningeal TB ($31.4 \pm 35.3/\mu\text{l}$).

In our study also we found that in patients with tubercular meningitis the CD4+ counts were <100, which is comparable with the mean reported by Leeds *et al.* (2012).^[7] Dias *et al.* (2016)^[8] also reported lowest CD4 count in meningeal TB, which is comparable to our study, but we found higher CD4 count in our tubercular meningitis patients in comparison to Dias *et al.* (2016)^[8] study.

In our study, the prevalence of pulmonary TB was 4.6% and extrapulmonary TB was seen in 7.8% of patients.

According to National TB Elimination Programme Annual Report, 2020,^[4] evidence has shown that the prevalence of TB in PLHA patients was approximately 5%, which is less in comparison to our study findings. Of the 200 TB patients, 75 (37.5%) patients had pulmonary TB; According to the WHO Index-TB Guidelines for Extrapulmonary TB in India, 2016^[9] have reported a prevalence of 50–60% of pulmonary TB among patients with newly diagnosed TB in PLHA patients; which is comparatively low in our study population. The prevalence of EPTB in our study was 62.5%, while according to Index-TB guidelines have reported a prevalence of 40–50% of EPTB among patients with newly diagnosed TB in PLHA patients; which is lower than that reported in our study.

Dharmshale *et al.* (2012)^[10] conducted a study on patients with HIV and non-HIV patients. They found 47.5% of HIV patients had extrapulmonary TB; which is lower than that reported in our study.

Dias *et al.* (2016),^[8] Study done by Dias *et al.* (2016)^[8] showed lymphatic involvement in 31.3% of patients, which is higher than that reported by our study and Pulmonary TB incidence is very high, i.e., 86.6%, which is lower in our study, i.e., 37.5%. The prevalence of pleural and meningitis was higher in the study.

CONCLUSION

We found that the prevalence of pulmonary TB is comparatively lower than the extrapulmonary TB in these patients. Our study supports the findings of various studies that while screening the HIV/AIDS patients for co-infections, TB should be definitely included in the study. As CD4+ T lymphocytes count decreases, the risk of development of TB is increases.

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