

Opportunistic Respiratory Infections and their CD4 Cell Correlation among Newly Detected HIV Patients Attending K R Hospital MysoreMridula D.¹, Chaithra A. N.², Madhu Kumar R.³, Suneetha. D.K.⁴¹Postgraduate, Department of General Medicine Mysore medical college and Research Institute²Assistant professor, Department of General Medicine Mysore medical college and Research Institute³Assistant professor, Department of General Medicine Mysore medical college and Research Institute⁴Professor, Department of General Medicine Mysore medical college and Research Institute

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Conflict of interest: Nil

Abstract:

Background: About 70% of HIV infected people usually have one or many respiratory infections during the course of their HIV disease. Respiratory system involvement may lead to wide variety of pulmonary illness that includes HIV-related opportunistic infections caused by bacterial, mycobacterial, viral, fungal, parasitic pathogens and neoplasms. A wide clinical spectrum of respiratory illness was seen among HIV patients, in consonance with their varying immune status. The immune system is damaged by virus making the infected individual vulnerable to malignancies and opportunistic infections which are common in the chest. This study makes an attempt to correlate the pulmonary illness and CD4 counts as it will help in better understanding this deadly duo of HIV and opportunistic infections.

Method: Total of 90 newly detected HIV patients above 18 years of age were included. Detailed clinical history taking and complete physical examination followed by specific tests including sputum analysis and chest radiographs were done. Their baseline CD4 counts were done to assess their degree of immunosuppression. Given pulmonary infections were then compared with CD4 count groups (CD4 countless and more than 200/cc).

Result: The study had 90 cases with mean CD4 count of 201.76 cells/microL. Majority of the pulmonary illness were observed below the CD4 count of 200 cells/mm³. The study found that majority of patients with Pulmonary Tuberculosis had CD4 count >200 cells / μ L (53.8%) and all patients with Extra-Pulmonary Tuberculosis had CD4 count <200 cells / μ L.

Conclusion: This study highlights that pulmonary tuberculosis still remains as the most common clinical entity in cases of HIV. This study also establishes that there is a higher prevalence of diseases such as PCP and extra pulmonary tuberculosis as the CD4 count level declines.

Keywords: HIV; CD4 Cell Count; Pulmonary Tuberculosis.

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Introduction

India is the third largest number of HIV cases in the world. [1] The disease poses formidable challenges for the progress, stability and development of the society. [2]

The prolonged course of human immunodeficiency virus (HIV) infection is marked by a decrease in the number of circulating CD4⁺ T helper cells and persistent viral replication, resulting in immunologic decline and death from opportunistic infections. [3]

Associated symptoms with this initial stage of infection occur to varying degrees of severity and may include fever, sore throat, skin rash, lymphadenopathy, splenomegaly, myalgia, arthritis and less often meningitis. The acute phase is followed by a clinically latent period with low level viral replication and a gradual fall in CD4 count

where the patient can remain asymptomatic for several months to years. In India, the mean duration of survival after diagnosis of HIV is 92 months. Patients with CD4 counts less than 200 cells/ μ L are 19 times more likely to die than those with CD4 counts greater than 350 cells/ μ L. [3]

Pulmonary infection was the dominant presentation in the initial years of the epidemic, and infectious and non-infectious pulmonary diseases remain the major causes of mortality and morbidity in persons living with HIV despite the development of effective antiretroviral therapy. [4]

Pulmonary symptoms may result from a wide spectrum of pulmonary illness that include both opportunistic infections which include bacterial, mycobacterial, fungal, viral, parasitic pathogens and neoplasms. [3]

This study is therefore aimed at evaluating the pattern of respiratory complications in relation to CD4 count amongst HIV seropositive patients.[3]

Aims and Objectives

1. To study respiratory opportunistic infections in newly diagnosed HIV infection cases.
2. To correlate CD4 cell count and respiratory opportunistic infections among newly detected HIV patients.

Materials and Methods

Study design: Cross sectional study.

Study period: 18 months: June 2022 to December 2023

Study population: Patients attending the ART centre / Patients admitted in medical wards, Krishnarajendra hospital, Mysore.

All patients above the age of 18 with newly confirmed HIV infection (ART naïve) as per NACO guidelines are the subjects of the study.

Enrolled patients were explained about the study. Informed written consent was taken from the patient to be a part of the study.

Detailed clinical history including presenting symptoms, past history, and complete physical examination followed by appropriate baseline and specific laboratory and radiological tests were done and clinical diagnosis was made based on the above evidences. CD4 count was estimated at the same point of time. Confidentiality of the data collected was maintained.

Statistical Methods

- Statistical analysis was done using IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp
- Descriptive statistical methods used were: mean, standard deviation, frequency and percentage
- Inferential statistics methods were t-test for independent samples, ANOVA, chi-square test

Inclusion Criteria:

All patients above the age of 18 with newly confirmed HIV infection (ART naïve) as per NACO guidelines are the subjects of the study.

Exclusion Criteria:

- People on ART
- Old PTB cases
- Old malignancies

- ICU and bedridden patients

Sample size Estimation

The sample size was decided in consultation with the statistician

Based on previous study conducted by Akhigbe R, Ugwu A, Manafa P, Caleb Y, Sidi M [5], the standard deviation 'd' of CD4 count cells was 271.65.

Considering the equal variances and standard deviation in the present study, Sample size is calculated using the equation

$$n = (Z\alpha + Z\beta)^2 \times \sigma^2$$

$$d^2$$

$$n = (1.96 + 0.84)^2 \times 271.65^2$$

$$80^2$$

$$n = 7.84 \times 73793.72$$

$$6400$$

$$n = 90.$$

Sample size was calculated to be 90

Where α is the Level Of Significance (Type I error), the probability of falsely rejecting a true null hypothesis and

$Z\alpha$ is the corresponding table value

β is the Type II error, the probability of failing to reject a false null hypothesis and $Z\beta$ is the corresponding table value

σ is the pooled standard deviation of the population being studied d is the size of the effect that is clinically worthwhile to detect

A p value <0.05 will be considered statistically significant

Results

To assess and compare various respiratory opportunistic illness in naive HIV patients and compare these in relation to CD4 counts, 90 subjects were part of the study.

CD4 Count Groups

By stratification of CD4 T lymphocyte count, 55 cases (61.1%) had CD4 count < 200 cells / μ L and 35 cases (38.8%) had CD4 count > 200 cells/ μ L .

Mean CD4 count was 201.76 cells / μ L with minimum and maximum being 15cells/ μ L and 512 cells/ μ L respectively.

Table 1: CD4 count groups

	Cases	Percent (%)
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CD4 Groups	count	<200 cells / μ L	55	61.1
		>200 cells / μ L	35	38.9
		Total	90	100.0

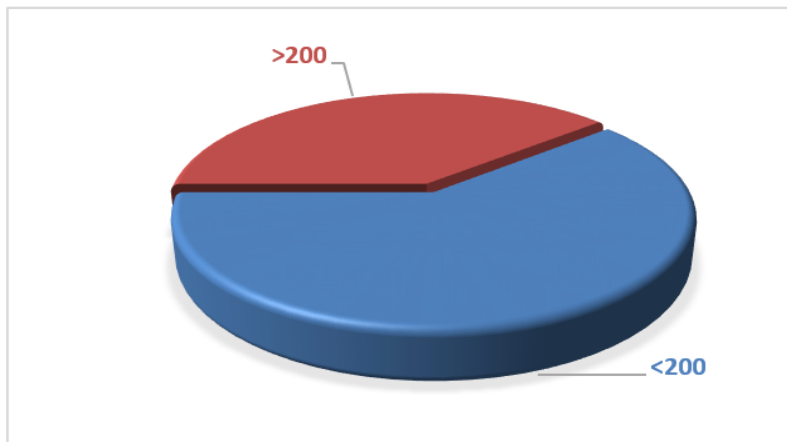


Figure 1: CD4 count groups

Opportunistic infections & CD4 Counts: Among patients with CD4 count less than 200, extrapulmonary tuberculosis was observed among 18.18% patients, pulmonary tuberculosis in 10.9%, PCP pneumonia in 10.9%, and military TB among 7.27%, esophageal candidiasis in 1.8% and disseminated histoplasma in 1.8% of them. Patients with CD4 more than 200 had 20% incidence of pulmonary tuberculosis, 2.8% incidence of Covid

bronchopneumonia. Some subjects had a combination of these findings. Extrapulmonary TB and PCP pneumonia were found more in the low CD4 count group. The relationship between CD4 count and opportunistic infections were evaluated by using Pearson chi-square test and the chi-square value 58.428 was statistically highly significant (P-value 0.000).

Table 2: Opportunistic infections & CD4 COUNTS

		CD4 Count		Total	
		<200cells / μ L	>200 cells / μ L		
Impression	Normal	Cases	2	11	13
		Percentage	15.4%	84.6%	100.0%
	PULM TB	Cases	6	7	13
		Percentage	46.2%	53.8%	100.0%
	EXTRAPULM TB	Cases	10	0	10
		Percentage	100.0%	0.0%	100.0%
	PCP	Cases	6	0	6
		Percentage	100.0%	0.0%	100.0%
	Covid	Cases	0	1	1
		Percentage	0.0%	100.0%	100.0%
	Histoplasma	Cases	1	0	1
		Percentage	100.0%	0.0%	100.0%
	Miliary Tb	Cases	4	0	4
		Percentage	100.0%	0.0%	100.0%
	Oral Candidiasis	Cases	0	1	1
		Percentage	0.0%	100.0%	100.0%
	Esophageal Candidiasis	Cases	1	0	1
		Percentage	100.0%	0.0%	100.0%
	Urti	Cases	1	12	13
		Percentage	7.7%	92.3%	100.0%
Others	Cases	22	3	25	
	Percentage	88.0%	12.0%	100.0%	
Pcp+Disseminated Tb	Cases	1	0	1	
	Percentage	100.0%	0.0%	100.0%	
Disseminated Tb+Esophageal	Cases	1	0	1	
	Percentage	100.0%	0.0%	100.0%	

	Candidiasis	Percentage	100.0%	0.0%	100.0%
Total		Cases	55	35	90
		Percentage	61.1%	38.9%	100.0%

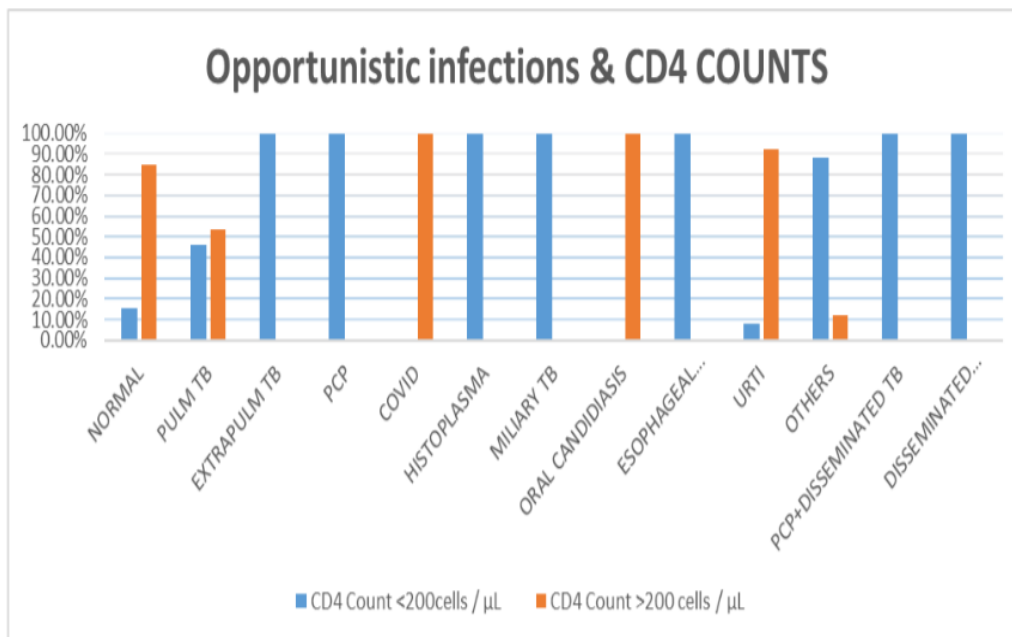


Figure 2: Opportunistic infections and CD4 count groups

Discussion

The study found that majority of patients with pulmonary TB had CD4 count >200 cells / μL (53.8%) and all patients with extra pulmonary TB had CD4 count <200 cells / μL. We found a strong correlation between occurrence of extra pulmonary TB and profound immunosuppression (CD4 count < 200 cells / μL).

This was in accordance with previous studies done by Lavanya Devi Palaniswamy et al [6]. Thus, pulmonary TB is more frequently seen than extra pulmonary TB in patients with relatively intact immune function (CD4 count > 200 cells / μL), and as immunosuppression advances, extra pulmonary TB becomes increasingly frequent. [6]

The incidence of Pneumocystis carni pneumonia was 10.9% and all the cases were identified with CD4 counts <200 cells/mm³. This was in accordance with previous study done by Ravi M Godavarthi et al [7] where the incidence of Pneumocystis carni pneumonia was 3.33% and all the cases were identified with CD4 counts <50 cells/mm³. The prevalence of co-infection with HIV varies widely across regions within India and outside India mainly due to the variation in the distribution of risk factors, geographic location etc. of the study population. [8]

Conclusion

Human Immunodeficiency Virus (HIV) infection commonly presents with a wide spectrum of lung manifestations that pose high mortality risks. The most common pulmonary manifestation in HIV patients was pulmonary tuberculosis followed by extrapulmonary TB, pneumocystis carni pneumonia and incidence of all these manifestations increased with the decline of CD4 counts.

The study found that majority of patients with pulmonary TB had CD4 count >200 cells / μL (53.8%) and all patients with extra pulmonary TB had CD4 count <200 cells / μL. Knowledge of the pattern of pulmonary complications in patients with HIV infection in relation to CD4 count will help clinicians develop faster diagnostic and therapeutic approach to patient management.

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