

PNEUMOCYSTIS JIROVECI PNEUMONIA: PREVALENCE IN HOSPITALISED PATIENTS, A STUDY CONDUCTED IN A TERTIARY CENTRE IN PUNJAB

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ABSTRACT

BACKGROUND

Pneumocystis jirovecii is a pathogen causing a life-threatening infection, Pneumocystis Pneumonia (PCP) in T helper cell deficient hosts.

METHODS

A retrospective analysis was done from 6th April 2012 to 11th September 2015. The clinical data of the positive patients for PCP by Silver Methenamine Staining of the samples were collected. CD4 counts were done for the HIV positive patients.

RESULTS

A total of 486 samples were sent to the Microbiology Lab during this period for Silver Methenamine Staining. Among the patients, 13 (35.15%) were diagnosed cases of HIV; 9 were Stage IV AIDS and all of these patients had CD4 counts less than 200/ μ L.

Fungal pneumonia was found to be a significant comorbidity in these patients and is of particular significance due to the diagnostic dilemma it can cause, since the radiological and physiological changes in both fungal and pneumocystis pneumonia are similar.

CONCLUSION

There should be a high index of suspicion for pneumocystis pneumonia in susceptible patients who show signs of atypical pneumonia and who do not respond to treatment with antibiotics or antifungals.

KEYWORDS

Pneumocystis Jirovecii, Pneumonia, Opportunistic Infections, CD4 Counts.

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INTRODUCTION

Pneumocystis jirovecii is a pathogen causing a life-threatening infection, Pneumocystis Pneumonia (PCP) in immunocompromised hosts.⁽¹⁾

The earliest report of this organism was by Chagas in 1909.⁽²⁾ Initially misidentified as a variant of Trypanosoma cruzi, it was later identified to be a whole other genus. Otto Jirovec identified this organism as causing interstitial pneumonia in infants in 1952.⁽³⁾ and Frenkel later proposed the classification of the human pathogen as a different species, because of the varying antigenic properties and the lack of cross-infection from animals to man and vice versa.

The outbreak of pneumocystis pneumonia among malnourished children in an orphanage in Iran in the 1950's was well documented.⁽⁴⁻⁸⁾ In the 1960's, it was a recognised pathogen in children with congenital T cell immune-deficiency.⁽⁹⁾ but the incidence came down after the introduction of anti-pneumocystis medications.

In the early 1980s, the increased incidence of pneumocystis pneumonia in a section of homosexual individuals in the United States led to the discovery of AIDS.⁽¹⁰⁾

Pneumocystis pneumonia is spread by airborne route and the rate of transmission is very high.⁽¹¹⁾ Studies have shown that immune-competent individuals can have the cysts colonised in their respiratory tract 24 hours after exposure to carriers and immune-competent people may act as carriers themselves even after latent infection has been cleared.⁽¹¹⁻¹³⁾ Studies show the presence of antibodies in children below the age of four and subsequent infections may be due to infection by other strains.⁽¹³⁾

Symptoms are vague and include mild cough, progressive dyspnoea (PO₂ less than 65 mmHg). Chest X-ray showing interstitial infiltrates and CT showing ground glass opacities.⁽¹⁴⁻¹⁶⁾ This feature as well as physiological and pathological changes in the lung mimics that of mild fungal pneumonia.

In HIV negative patients the disease is more acute and more severe, progressing faster with a higher morbidity as it usually requires ICU admission.⁽¹⁷⁾ while in HIV positive patients it shows a subacute course. The most common risk factors for developing PCP are solid organ tumours, haematological malignancies, inflammatory conditions and stem cell therapy. The incidence of pneumocystis pneumonia has been found to be associated with a T helper cell deficiency (CD4 counts) of less than 200/ μ L.

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The median CD4 count in various studies was found to be 70/ μ L in such patients. The infection is rare above 200/ μ L, but cases have been reported.⁽¹⁸⁾

The diagnosis of PCP should be made with alacrity due to the highly progressive nature of the disease. There have been a number of advances in the diagnosis of Pneumocystis infection including qrt-PCR and serological detection of β -D glucan- a cell wall component of the fungus. But these have disadvantages - PCR results have to be taken in the light of possible colonization and serological tests are non-specific. Therefore, microscopy remains the gold standard of diagnosis even though it is limited by its subjectivity and the need of an experienced microscopist.

AIM

We undertook this study to find out the prevalence of Pneumocystis pneumonia in patients in a tertiary care hospital in North India since studies done in this part of India were less.

MATERIALS AND METHODS

A retrospective analysis was done from 6th April 2012 to 31st December 2015; the clinical data of the positive patients for PCP by Silver methenamine staining of the sample were collected. The samples were sent to the Microbiology Lab from all departments and all wards including ICU's.

Silver methenamine staining was done on the samples and the samples were examined by an experienced microscopist.

The absolute T helper cell count (CD4 count) was estimated by flow cytometry using Alere PIMA cartridges. The cartridge works on the volumetric principle - 5 μ L of venous blood is drawn into the capillary receptacle. The cartridge has freeze-dried antibodies and during incubation it mixes with the blood and the CD4 cells are counted using inbuilt static camera and the reading is printed out.

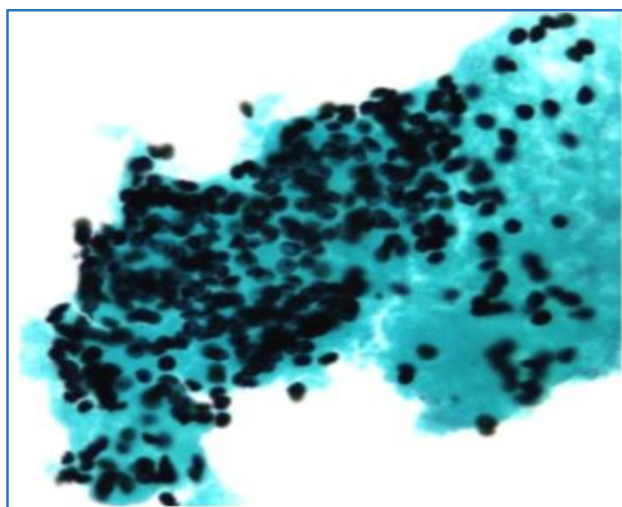


Fig. 1: Oocysts of Pneumocystis Jirovecii in a Sputum sample (Silver Methenamine Staining)

RESULTS

A total of 486 samples were sent to the Microbiology Lab during this period for Silver methenamine staining. Of these, 47 samples of 37 patients were found to be positive for oocysts of Pneumocystis jirovecii. Of the positive samples

sent, 29 (61%) were Sputum, 4 (9%) were MiniBAL samples, 13 (28%) were Bronchial secretions and 1 (2%) was a BAL sample.

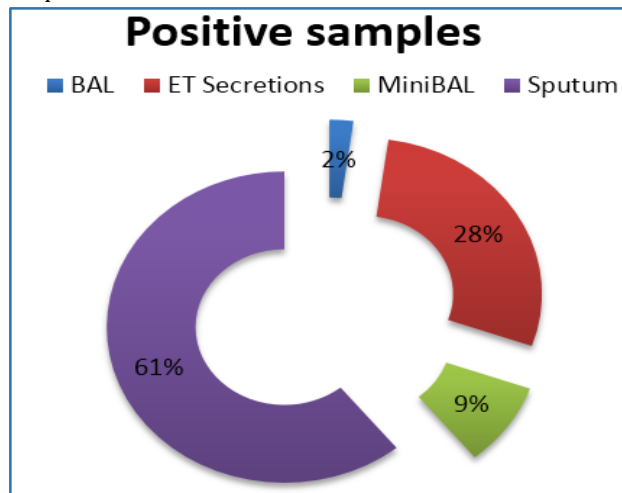


Fig. 2: Samples Positive for Pneumocystis Jirovecii

Among the patients, 13 (35.15%) were diagnosed cases of HIV and 9 of these were Stage IV AIDS; all of these patients had CD4 counts less than 200/ μ L.

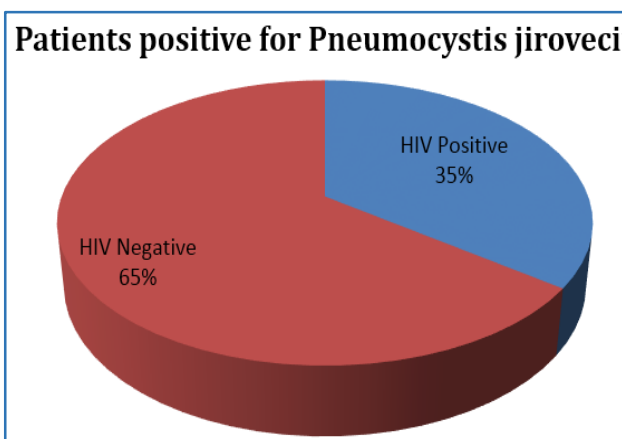


Fig. 3: HIV Status of Patients Positive for Pneumocystis Jirovecii

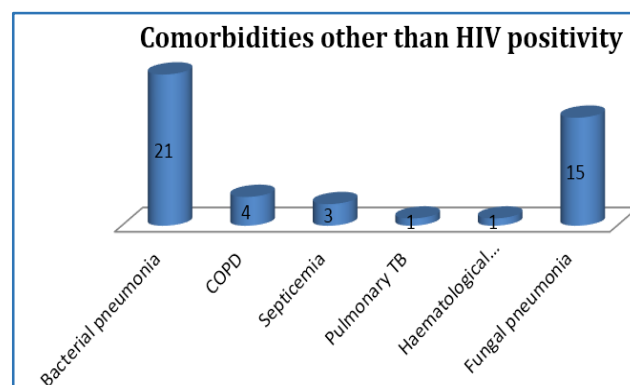


Fig. 4: Comorbidities of Positive Patients

Fungal pneumonia was found to be a significant comorbidity; 15 out of the 47 positive samples (31.9%) were found to have growth on fungal culture, predominantly with

Candida (In 14 of the cases) and one with Aspergillus. CD4 counts were done in 25 of the 37 cases.

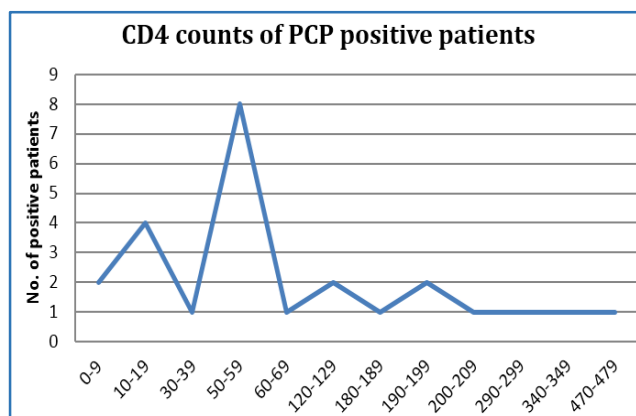


Fig. 5: CD4 counts of Patients with PCP

DISCUSSION

The incidence of PCP in patients with atypical pneumonia was found to be 9.6% in the general population. Approximately, a third of these (35.15%) were diagnosed to be HIV positive. CD4 counts were done in all of the HIV positive patients, but only in 3 of the HIV negative patients.

The mean CD4 count was 110.8 and this is comparable to other studies (18), which have shown mean CD4 counts of 70 for PCP infection.

Discounting the 3 outliers who were HIV negative, the mean becomes 94.7 in our study. The graph (Fig. 5) shows bunching of positive points in the lower end and the maximum number of positive patients had counts of less than 70 or near it. This finding also correlates with other studies done.⁽¹⁸⁻¹⁹⁾ Our finding also corresponds with studies done earlier in India in both the northern and southern regions.⁽²⁰⁻²¹⁾

Concomitant bacterial (44.6%) and fungal pneumonia (31.9%) is a significant finding in our study. In such cases, the dilemma for the clinician is to decide whether to treat the positive Pneumocystis finding as an infection or merely colonization. Radiological examinations may be used to correlate these findings, but the non-specificity of Chest X-ray findings in atypical pneumonia and the fact that HRCT chest shows ground glass opacities for both fungal and pneumocystis pneumonia complicates this further.

CONCLUSION

There should be close collaboration between the clinician and the microbiologist regarding these high risk patients. Any case of pneumonia not responding to antibiotics or antifungals should be suspected of atypical infections like PCP and treated aggressively due to the fatal course of the illness, especially in HIV negative patients.

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