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CONCURRENT COURSE OF HIV INFECTION WITH OPPORTUNISTIC DISEASES

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RELEVANCE: HIV infection (Human Immunodeficiency Virus) remains one of the most pressing global health challenges. Despite significant advances in antiretroviral therapy (ART) and preventive strategies, HIV continues to predispose individuals to a wide range of opportunistic infections (OIs). These opportunistic diseases dramatically affect the morbidity and mortality of people living with HIV (PLHIV). In many low- and middle-income countries, limited access to comprehensive care and late diagnosis often exacerbate the burden of opportunistic infections [1]. Understanding the clinical, epidemiological, and immunological aspects of opportunistic diseases, alongside ensuring effective treatment and prevention of HIV, is critical for reducing related complications, improving patients' quality of life, and achieving the global goals for HIV/AIDS control [2].

Keywords: HIV infection, Opportunistic infections (OIs), Antiretroviral therapy (ART), Immune suppression, Tuberculosis (TB), Pneumocystis pneumonia (PCP), Cryptococcal meningitis, Clinical management

INTRODUCTION

Opportunistic diseases commonly occur in the setting of immune suppression, where the body's defense mechanisms are significantly compromised. In individuals with HIV infection, the progressive loss of CD4+ T-cells diminishes cellular immunity, making them prone to infections and malignancies that typically do not cause severe disease in immunocompetent hosts [3].

Common opportunistic infections include Mycobacterium tuberculosis (especially in high-prevalence regions), Pneumocystis jirovecii pneumonia (PCP), Cryptococcus neoformans meningitis, and cytomegalovirus (CMV) retinitis, among others. These diseases may lead to significant morbidity and mortality if not diagnosed early and managed effectively [4].

Since the scale-up of combination antiretroviral therapy (cART), the incidence of many opportunistic infections has declined dramatically. However, late diagnosis, poor adherence to treatment, and limited healthcare resources continue to fuel the prevalence of these infections among PLHIV. This study aims to investigate the spectrum, clinical presentation, and outcomes of opportunistic diseases in patients with HIV infection and to explore effective strategies for diagnosis, treatment, and prevention [5].

MATERIALS AND METHODS

Study Design and Setting - A prospective, observational study was conducted in the Infectious Diseases Department of a tertiary care hospital, where both inpatient and outpatient services for HIV-infected individuals are provided. The study lasted for 12 months, from January 2024 to January 2025.

Study Population

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Inclusion Criteria: Age ≥ 18 years. Confirmed diagnosis of HIV infection (by ELISA and Western blot, or rapid testing confirmed by a secondary method). Presence of one or more clinically or laboratory-confirmed opportunistic infections.

Exclusion Criteria: Patients who did not give informed consent. Patients lost to follow-up before full investigation.

Data Collection

All participants underwent:

Detailed Clinical Evaluation: Documentation of demographics, clinical history, presenting symptoms, and physical examination findings.

Laboratory Tests: CD4+ T-cell count (using flow cytometry). Complete blood count (CBC). Biochemical profile (including liver and renal function tests). Specific diagnostic tests for opportunistic infections (e.g., sputum microscopy and culture for Mycobacterium tuberculosis, serum Cryptococcal antigen test, PCR for CMV, etc.)

Radiological Examinations: Chest X-ray and/or chest CT for suspected pulmonary disease. MRI or CT scan of the brain for suspected central nervous system (CNS) infections.

Treatment and Follow-up

Antiretroviral Therapy (ART): All patients were either on ART or initiated on treatment according to national guidelines, typically based on the WHO recommendations.

OIs Management: Specific antimicrobial therapies were given according to the identified opportunistic pathogen (e.g., anti-tubercular therapy for TB, high-dose trimethoprim-sulfamethoxazole for PCP, amphotericin B plus fluconazole for cryptococcal meningitis, etc.).

Follow-up Visits: Patients were followed up monthly to assess clinical improvement, side effects, adherence to therapy, and virological response if available.

Statistical Analysis - Data were entered into a secure database and analyzed using statistical software. Descriptive analyses (mean, median, frequencies) were performed for quantitative variables [6]. Associations between variables were evaluated using chi-square or Fisher's exact test, as appropriate, with a significance threshold set at $p < 0.05$.

ANALYSIS AND RESULTS

Demographic and Clinical Characteristics - A total of 200 patients with confirmed HIV infection and at least one opportunistic disease were enrolled. The mean age of participants was 35.4 ± 8.9 years, with a male-to-female ratio of approximately 1.2:1. The median baseline CD4+ count at presentation was 162 cells/µL (range: 15–400 cells/µL).

Spectrum of Opportunistic Infections

The most common opportunistic infections identified were:

1. Tuberculosis (TB): 40% (n=80) of cases, with pulmonary TB as the most frequent form, followed by extrapulmonary involvement such as lymph nodes and the CNS.

2. Pneumocystis Pneumonia (PCP): 25% (n=50) of cases, often presenting with progressive dyspnea and hypoxia.

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3. Cryptococcal Meningitis: 15% (n=30) of cases, with headache, fever, and neck stiffness as the most common symptoms.

4. Cytomegalovirus (CMV) Retinitis: 8% (n=16), presenting with visual disturbances and fundoscopic findings of "pizza pie" retinopathy.

5. Other OIs: 12% (n=24), including oral/esophageal candidiasis, toxoplasmosis, and herpes simplex virus reactivations.

Clinical Outcomes - Among the TB group, 70% (n=56) achieved culture conversion by the end of the intensive treatment phase, reflecting good adherence and effective anti-tubercular therapy. PCP treatment success was observed in 80% (n=40) of cases after standard therapy with trimethoprim-sulfamethoxazole and adjunctive corticosteroids for moderate-to-severe cases [7]. Cryptococcal meningitis posed a higher mortality rate, with 6 (20%) deaths in that group, often due to late presentation or severe intracranial hypertension. Visual acuity improved or stabilized in 75% (n=12) of patients with CMV retinitis who received antiviral therapy (ganciclovir or valganciclovir).

Factors Affecting Prognosis

CD4+ Count: Patients with CD4+ counts <100 cells/μL had more severe disease and worse outcomes, highlighting the need for earlier diagnosis and ART initiation.

ART Adherence: High levels of adherence (>95%) correlated with better virological suppression and fewer recurrent opportunistic infections.

Late Presentation: A significant proportion of patients presented at advanced disease stages, emphasizing gaps in HIV testing, linkage to care, and retention in care systems.

CONCLUSION

This study demonstrates that opportunistic infections remain a substantial cause of morbidity and mortality among people living with HIV, particularly in those who present with advanced disease and low CD4+ counts. Tuberculosis was the most common opportunistic infection, followed by PCP and cryptococcal meningitis, highlighting the major pathogens that require vigilant monitoring and prompt treatment [8].

Effective management of HIV and its comorbid opportunistic infections necessitates a multifaceted approach: early HIV diagnosis, timely initiation of ART, prompt and accurate diagnosis of OIs, and strict adherence to treatment regimens. Strengthening laboratory capacity and improving awareness about opportunistic infections are key to reducing diagnostic delays and improving patient outcomes [9].

RECOMMENDATIONS

Strengthen Screening and Early Diagnosis: Expand community-based HIV testing and active case-finding for TB and other OIs, especially among high-risk populations. Implement rapid molecular diagnostic methods for timely and accurate diagnosis [10].

Improve Treatment Access and Adherence: Ensure uninterrupted ART availability and enhance adherence support (counseling, peer support groups). Provide integrated treatment for HIV and OIs under one roof to reduce patient visits and improve care coordination.

Enhance Healthcare Provider Training: Conduct regular training sessions on the diagnosis and management of OIs for healthcare workers at all levels. Promote standardized guidelines and protocols for the management of HIV and opportunistic infections [11].

Address Social Determinants of Health: Develop programs to reduce stigma and discrimination, which often hamper timely care-seeking. Strengthen patient education on recognizing early symptoms and the importance of follow-up and prophylactic treatments.

Implement Effective Surveillance and Research: Establish robust monitoring systems to identify trends in OI prevalence and resistance patterns. Encourage research on novel diagnostics, vaccines, and therapeutic agents to combat emerging opportunistic pathogens [12].

By reinforcing these strategies, healthcare systems can significantly lower the burden of opportunistic infections among people living with HIV and move closer to achieving the global goals of ending the HIV/AIDS epidemic.

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