

## Analysis of the Relationship Between HIV/AIDS Clinical Stage and Opportunistic Infections at Hospital X

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### ABSTRACT

Opportunistic infections remain a major cause of morbidity and mortality among people living with Human Immunodeficiency Virus (HIV). The progressive decline in immune function increases susceptibility to infections such as tuberculosis, candidiasis, and toxoplasmosis. The World Health Organization (WHO) clinical staging system is widely used to assess HIV disease progression and is often associated with the occurrence of opportunistic infections. This study aimed to analyze the association between HIV clinical stage and opportunistic infections among HIV/AIDS patients at Hospital X. This study employed an observational analytic design with a cross-sectional approach. Data were obtained from medical records of HIV/AIDS patients, with a total sample of 193 patients selected using total sampling. Statistical analyses included univariate and bivariate analyses using the chi-square test. The majority of patients were in clinical stage III (80.3%). The prevalence of opportunistic infections was 14.0%. The results of the chi-square test showed no significant association between clinical stage and opportunistic infections ( $p = 0.206$ ). Although opportunistic infections were more frequently observed in advanced stages, the relationship was not statistically significant.

**Keywords:** HIV/AIDS, opportunistic infections, clinical stage, antiretrovirals, CD4

### INTRODUCTION

Human Immunodeficiency Virus (HIV) is a virus that attacks the human immune system, specifically CD4 lymphocytes. A progressive decline in CD4 cell count weakens the immune system, making individuals susceptible to various opportunistic infections. Opportunistic infections are infections that occur more frequently or are more severe in individuals with compromised immune systems due to HIV infection (National Institutes of Health, 2024). Globally, HIV remains a significant public health problem. It is estimated that more than 40 million people will be living with HIV worldwide by 2024. Although antiretroviral therapy has significantly reduced HIV-related mortality, opportunistic infections remain a major cause of morbidity in patients with severe immunosuppression (Wongkittipong, 2024). Opportunistic infections frequently found in HIV patients include tuberculosis, pneumocystis pneumonia, candidiasis, toxoplasmosis, and cryptococcosis. These infections often occur when the CD4 count falls below 200 cells/mm<sup>3</sup>. Several studies have shown that the prevalence of opportunistic infections in HIV patients ranges from 28–44%. A systematic study reported a prevalence of opportunistic infections of 43.97% in HIV patients undergoing antiretroviral therapy. Furthermore, other studies have shown that approximately 33% of newly diagnosed HIV patients experience opportunistic infections, with most of them in clinical stages III and IV according to the WHO classification. The World Health Organization (WHO) classifies HIV clinical stages into four stages based on



clinical manifestations. Stages III and IV typically indicate significant immune system impairment and are often accompanied by opportunistic infections (Low et al., 2021). In developing countries, including Indonesia, many HIV patients are diagnosed at an advanced stage, increasing the risk of complications from opportunistic infections. Therefore, research into the relationship between opportunistic infections and clinical stage is important to improve understanding of HIV disease progression and support clinical decision-making in patient management (Annals of Global Health, 2024).

## METHODS

This study used an observational analytic design with a cross-sectional approach. The study was conducted at Hospital X, a referral hospital for HIV/AIDS. The study population included all HIV/AIDS patients recorded in the hospital medical records, using a total sampling technique. The inclusion criteria were patients diagnosed with HIV/AIDS who had complete data on clinical stage and opportunistic infections. The study variables consisted of HIV clinical stage as the independent variable and opportunistic infection as the dependent variable. Demographic characteristics included age, gender, and antiretroviral therapy. Data were analyzed using SPSS version 29. Univariate analysis was used to describe the data, and bivariate analysis was performed to examine the association between clinical stage and opportunistic infection.

## RESULTS

Based on this research, the results obtained were 193 samples. The results of the respondent characteristics research can be seen in Table 1.1

Table 1. Characteristics of Respondents of HIV/AIDS Patients at Hospital X

Characteristic	n	%
<b>Gender</b>		
Male	102	52,8%
Female	91	47,2%
Total	193	100%
<b>Education</b>		
Elementary School	53	27,5%
Middle School	66	34,2%
High School	54	28,0%
Academy	10	5,2%
No Formal Education	10	5,2%
Total	193	100
<b>Job</b>		
Working	141	73,1%
Not Working	52	26,9%
Total	193	100%
<b>Clinical stage</b>		
Stage I	0	0%
Stage II	25	13,0%
Stage III	155	80,3%
Stage IV	13	6,7%

Total	193	100%
<b>Opportunistic Infection</b>		
Yes	35	14%
No	158	86%
Total	193	100%

Based on the results of the demographic characteristics analysis, there were more male genders than females, namely 102 (52.8%) respondents, while for the education of the most patients were at the junior high school level, namely 66 (34.2%) respondents. Patients with working employment status had a higher percentage than those without work, namely 141 (73.1%) respondents, while for the clinical stage classification, there were many in stage III, namely 155 (80.3%) respondents with opportunistic infections as many as 35 (14%) respondents.

Table 2. Analysis of the Relationship between Clinical Stage and Opportunistic Infections in HIV/AIDS Patients at Hospital X

Clinical Stage	Opportunistic Infection		
	Yes	No	Total
Stage II	2	23	25
Stage III	29	126	155
Stage IV	4	9	13
Total	35	158	193

Table 3. Chi-Square Test Results for Clinical Stages of Opportunistic Infections

Statistic	Value
Chi-Square	3.162
df	2
p-value	0.206

Bivariate analysis using the Chi-Square test showed that the majority of patients with opportunistic infections were in clinical stage III, namely 29 patients (15.6%). In stage IV, there were 4 patients (30.8%) with opportunistic infections, while in stage II there were 2 patients (8%). The results of the statistical test showed a p value of 0.206 ( $p > 0.05$ ), which means there was no significant relationship between HIV clinical stage and the incidence of opportunistic infections in this study.

## DISCUSSION

This study shows that the majority of HIV patients are in clinical stage III. These findings align with global HIV epidemiology reports that some patients are still diagnosed after significant immunosuppression (WHO, 2024). The prevalence of opportunistic infections in this study was 14%. This figure is lower than previous studies that reported a prevalence of opportunistic infections of 28% in HIV patients who had not received antiretroviral therapy (Moran, 2024). Bivariate analysis using the Chi-Square test showed no significant association between HIV clinical stage and the incidence of opportunistic infections ( $p = 0.206$ ). In HIV/AIDS patients in this study, several factors influencing the

incidence of opportunistic infections include low CD4 count, adherence to ARV therapy, nutritional status, and clinical stage of the disease. Meta-analyses have shown that patients with advanced clinical stages have an almost fivefold higher risk of developing opportunistic infections. In addition to ARV therapy, another factor that can influence the incidence of opportunistic infections is the timing of HIV diagnosis (Mora L, 2024). In some cases, patients may have been diagnosed at an advanced stage but have not experienced opportunistic infections due to prompt and appropriate medical treatment. Conversely, patients in earlier clinical stages are still at risk of developing opportunistic infections if other risk factors such as poor nutritional status, comorbidities, or poor treatment adherence are present. In this study, statistical analysis showed no significant association between opportunistic infections and clinical stage. This could be due to several factors, such as the use of effective antiretroviral therapy, which suppresses the development of opportunistic infections. Furthermore, modern antiretroviral therapy has been shown to significantly reduce the incidence of opportunistic infections and improve the quality of life of HIV patients. Nevertheless, screening for opportunistic infections remains important, especially in patients with advanced clinical stages or low CD4 counts (Gebremichael, 2024).

## CONCLUSION

Based on the results of the study on the analysis of relationship between clinical stages to opportunistic infection HIV/AIDS patients in hospital X, it can be concluded that the majority of patients were in clinical stage III with a total of 155 patients (80.3%), followed by stage II with 25 patients (13.0%) and stage IV with 13 patients (6.7%). There was no significant relationship between the clinical stage of HIV and the incidence of opportunistic infections ( $p=0.206$ ) in HIV/AIDS patients in this study.

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