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Original Research Article

VIRAL LOAD AND OPPORTUNISTIC INFECTION AS THE INDICATOR OF QUALITY-OF-LIFE PEOPLE WITH HIV/AIDS

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Abstract

Background: Human immunodeficiency virus (HIV) is a significant concern in the field of global health. However, studies on the relationship between viral load, opportunistic infections, and quality-of-life among them are limited.
Objectives: This study aims to determine the relationship between viral load count, the presence of opportunistic infection, and the quality-of-life among people living with HIV.
Methods: A cross-sectional study was conducted involving 35 respondents recruited through convenience sampling. The quality-of-life of individuals living with HIV was assessed using the World Health Organization Quality-of-Life instrument for HIV. Statistical analysis using descriptive statistics, including mean, standard deviation, and proportion, and bivariate analysis with p-value<0.05.
Results: Of the 35 participants, the majority were male (57.1%), with a mean age of 41.63 (9.09), and had a low education level (51.4%). The mean quality-of-life score was 86.88 (12.27), with a mean duration of ARV treatment of 7.23 years (5.36), undetectable viral load (68.6%), living with opportunistic infections (80%), and with tuberculosis being the most common (52.63%). There was a significant correlation between viral load and overall quality-of-life (p-value 0.04).
Conclusion: The results of viral load testing and the identification of opportunistic infections can serve as indicators to assess the quality-of-life among people living with HIV. The outcomes of this study have practical implications for enhancing healthcare services in clinical settings. This information can guide the implementation of targeted interventions to strengthen social relationships and these individuals' environmental quality-of-life.

Keywords: *Human Immunodeficiency Virus, Opportunistic infections, Quality of life, Viral load*

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INTRODUCTION

Human immunodeficiency virus (HIV) is a significant concern in the field of global health. Every year, there is an increase of 1.7 million people recorded living with HIV in 2019, more than three times the 2020 target (UNAIDS, 2020). The estimated number of people living with HIV was 39 million, and 630,000 among them died due to HIV by the end of 2022 (UNAIDS, 2023).

Median scores (ranging from 0 to 100) were highest for physical (69; interquartile range: 56–81) and environmental (69; 56–75) quality of life (QoL), while the lowest scores were observed for social (56; 44–69) and psychological (56; 44–69) QoL. People living with HIV (PLWH) who had three or more comorbidities, experienced HIV-related stigma, or earned less than €1,500 per month exhibited significantly lower median adjusted scores across physical, psychological, social, and environmental QoL domains compared to their respective reference groups. Although over half of PLWH reported having good or very good QoL, the goal of achieving good QoL for 90% of PLWH has not yet been met.

The intricacies of the challenges faced by individuals living with HIV contribute to a deterioration in their quality-of-life (Cunha et al., 2024; Hasanah et al., 2019; Sastra et al., 2019). Numerous studies have demonstrated that factors such as age, gender, education level, unemployment, comorbidities, household, and CD4 count are associated with the quality-of-life among people living with HIV (Cunha et al., 2024; Du et al., 2024). A viral load has been recognized as one of the pivotal indicators of the success of anti-retroviral treatment (Obeagu et al., 2024). In summary, viral load is a fundamental parameter for monitoring the progression of HIV and the effectiveness of ART. Studies have shown that adherence to ART and timely initiation of treatment are crucial for viral suppression (Housny et al., 2016). The goal of ART is not only to improve individual health outcomes but also to prevent the transmission of HIV, contributing to global efforts to control the epidemic (Lecher, 2021). Continued engagement and improvement in access to viral load testing are necessary to meet global targets and ensure the success of ART programs (Ibrahim et al., 2020; Rangarajan et al., 2016).

However, limited studies have established a relationship between viral load count, the presence of opportunistic infection, and the quality-of-life among them. The relationship between viral load count, the presence of opportunistic infections, and quality-of-life in HIV patients is complex and multifaceted. while not all studies directly link viral load and opportunistic infections with quality-of-life, the evidence suggests that interventions that reduce viral load and manage opportunistic infections can lead to improvements in the quality-of-life for HIV patients (Arora & Mehta, 2018; Benvegnú et al., 2021; Mosisa et al., 2024). Although there is are positive relationship between quality-of-life and the presence of opportunistic infection (Koster et al., 2022), previously published articles evaluated the direct relationship between viral load and quality-of-life (e Silva et al., 2014) without taking into account the presence of opportunistic infection.

Objective(s): to determine the relationship between viral load count, the presence of opportunistic infection, and the quality-of-life among people living with HIV with a more advanced statistical analysis.

METHOD

Study Design

This was a prospectus cross-sectional study to identify the relationship between viral load count, the presence of opportunistic infection, and the quality-of-life people living with HIV.

Setting

Data collection occurred from March to August 2023 within the outpatient ward of RSPI Prof. Dr. Sulianti Saroso, Jakarta, Indonesia. A team of three trained nurses

gathered information concerning participants' characteristics, infection opportunities, and quality-of-life. On the other hand, the viral load testing was carried out by laboratory personnel.

Research Subject

The sample size was determined using G-Power 3.1, considering an effect size of 0.5, a significance (α) of 5%, a power of 95%, a total of 3 predictors, and a 10% risk of margin errors. As a result, this study included data from 35 respondents. The sample was recruited through a convenience sampling method adhering to specific inclusion and exclusion criteria. Individuals living with HIV were included in this study if they met the following criteria: (1) aged > 18 years old; (2) had been undergoing ARV treatment for a minimum of one year; (3) were scheduled for a viral load count test; and (4) possessed the ability to read and write. Conversely, the individual who (1) has psychological or mental disorders and (2) do not agree to participate were excluded from this study.

Instruments

Participant characteristics were gathered using a self-designated questionnaire survey encompassing age, gender, educational level, marital status, and occupation. Information on the duration of ARV treatment and the utilization of opportunistic infections was extracted from participants' medical records.

The quality-of-life of individuals living with HIV was assessed using the World Health Organization Quality-of-Life instrument for HIV (WHOQOL-HIV BREF). This instrument consists of 31 items that evaluate six domains of quality-of-life: physical, psychological, level of independence, social relationship, environment, and spiritual/religious/personal belief among people living with HIV. The scores on this scale range from four to 20, with higher scores indicating a better quality-of-life. The WHOQOL-HIV BREF has been translated into Indonesian by Nanda et al (2017) and demonstrated favorable psychometric properties. The instrument exhibited good coefficient correlation for each domain (ranging from 0.60-0.79), and its internal consistency was measured by Cronbach alpha ranging from 0.51 to 0.79.

The viral load testing was conducted in the hospital laboratory on the same day the participants completed the questionnaire. The viral load count information was communicated through medical record documentation within three to four weeks after collecting the blood sample. The results were categorized as "detected" or "undetected" viral load.

Data Analysis

Statistical analysis was conducted using Jamovi. Descriptive statistics, including mean and standard deviation (SD), were used to present the data for variables: age, length of ARV treatment, number of opportunistic infections, and quality-of-life, as they exhibited a normal distribution. Categorical variables: sex, education level, opportunistic infections, and viral load count were presented in proportion and percentage (%).

The relationship between quality-of-life and the risk factors (viral load, opportunistic infections, and number of opportunistic infections) was examined through linear regression analysis. The data were presented in terms of both unadjusted and adjusted correlation coefficients (r) and corresponding p-values. Moreover, a supplementary analysis was conducted to assess the potential synergistic effect between viral load, opportunistic infections, and quality-of-life. The results of this analysis were presented in terms of intercepts and coefficient estimates. A p-value of less than 0.05 indicated a statistically significant effect in all studies.

Ethical Consideration

The study protocol underwent a thorough review and received approval from the Ethical Department of the Faculty of Nursing at Muhammadiyah Jakarta University (0466/F.9-UMJ/IV/2023) and RSPI Prof. Dr.

Sulianti Saroso (DP.04.03/D.XXXIX/6091/2023.

RESULTS

Regarding demographic characteristics, the average (standard deviation) age was 41.63 years (9.09), length of ARV treatment 7.23 years (5.36), opportunistic infections 1.09 (0.81), quality-of-life score 86.88 (12.27). Most participants were male (57.1%) and had a low education level (51.4%). A significant portion had undetected viral load (68.6%) and were living with opportunistic infections (80%), with tuberculosis being the most common (52.63%) (**Table 1**).

Table 1. Characteristics of HIV Respondents (n=35)

Characteristic	n (%)	Mean (SD)
Age		41,63 (9,09)
Duration of ARV treatment		7,23 (5,36)
Gender		
Female	15 (42,9)	
Male	20 (57,10)	
Education		
Elementary School	2 (7,8)	
Junior High School	4 (19,6)	
Senior High School	18 (51,4)	
College	11 (31,4)	
Opportunistic Infections		
Present	28 (80)	
Absent	7 (20)	
Number of OI		
Diagnosis of OI	1,09 (0,81)	
Pulmonary Tuberculosis		20 (52,63)
Oral Candidiasis		5 (13,16)
Toxoplasmosis		5 (13,16)
Pruritic Papular Eruption		3 (7,89)
Enlargement of Lymph Nodes		3 (7,89)
Gastroenteritis		1 (2,63)
Other Fungal Infections		1 (2,63)
Viral Load		
Undetected	24 (68,6)	
Detected	11 (31,4)	
Quality of Life		86,88 (12,27)

Abbreviations. Human immunodeficiency virus (HIV); standard deviation (SD); Sample size (n); percentage (%); anti-retroviral (ARV; elementary school (SD; junior high school (SMP); senior high school (SMA)

The linear regression analysis yielded a statistically significant correlation between viral load and the overall quality-of-life (p-value = 0.04). Approximately 13% of the variance in the quality-of-life among people living with HIV was influenced by viral load (Adjusted r2 = 0.13). Specifically, viral load exhibited a significant association with social relationships and environment domains within the quality-of-life, with corresponding slopes of 18% and 19%, respectively (**Table 2**). Although the analysis did not indicate a significant correlation between opportunistic infections and quality-of-life, a noteworthy correlation was identified (p-value = 0.02). A considerable 38% of the quality-of-life among people living with HIV was linked to the number of opportunistic infections. Each additional opportunistic infection was associated with a decrease of approximately -5.75 points in the quality-of-life score (**Table 3**).

Table 2. Relationship Between Opportunistic Infections and Viral Load with the Quality of Life (n=35)

Variabel	Opportunistic Infections		Viral Load	
	R	*Adj R²*	*R*	*Adj R²*
Total Quality of Life	0,07	-0,03	0,36	**0,13***
Physical Domain	-0,00	0,02	0,22	0,02
Psychological Domain	0,13	-0,01	0,27	0,05
Independence Domain	0,13	-0,01	0,10	-0,02
Social Domain	0,02	-0,03	0,45	**0,18***
Environmental Domain	0,07	-0,03	0,46	**0,19***
Spiritual Domain	0,09	-0,02	0,22	0,02

Abbreviations. Correlation coefficient (R); Adjusted coefficient of determination (Adjusted R^2); linear regression analysis

Table 3. Opportunistic Infection and Viral Load Predictors of Quality-of-Life (n=35)

Variabel	Total Quality of Life		Physical Domain		Psychological Domain		Independence Domain		Social Domain		Environmental Domain		Spiritual Domain	
	Est	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*
Intercept	80,54		14,66		13,78		13,70		11,88		12,74		13,78	
Opportunistic Infections														
No OI - OI present	0,04	0,99	0,69	0,46	0,48	0,66	-0,77	0,40	-0,66	0,57	-0,11	0,89	0,40	0,79
Viral Load														
Undetected VL - Detected VL	9,24	**0,04**	0,91	0,26	1,37	0,14	0,57	0,47	2,58	**0,005**	2,19	**0,006**	1,62	0,23

Abbreviations. pValue (p); opportunistic infections (IO); viral load (VL)

Furthermore, the analysis indicated that individuals with undetected viral load tended to have a higher overall quality-of-life score, represented by the equation: Quality-of-Life Total Score = 80.54 + 9.24 * Undetected viral load. Moreover, those living with HIV and having undetected viral load exhibited improved social relationships (11.8 + 2.58 * Undetected viral load) and a better environment (12.74 + 2.19 * Undetected viral load) (**Table 3**).

The synergetic linear regression revealed that none of the four conditions showed a significant effect on overall quality-of-life among people living with HIV. However, the results indicate individuals with detected viral load and presence of opportunistic infection have the lowest quality-of-life (Quality-of-life score = 89.63+ [-9.20] * detected viral load and presence of opportunistic infection) followed by detected viral load, and no opportunistic infections (Quality-of-life score = 89.63+ [-7.93] * detected viral load and no opportunistic infection) (**Table 4**).

Table 4. Opportunistic Infection Predictors of QoL HIV (n=35)

Predictor	Total Quality of Life		Physical Domain		Psychological Domain		Independence Domain		Social Domain		Environmental Domain		Spiritual Domain	
	Est	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*	*Est*	*p*
Intercept[a]	89,63		16,17		15,47		13,17		13,67		14,83		16,33	
OI Present - VL Detected	-9,20	0,15	-1,57	0,18	-1,79	0,17	0,33	0,76	-1,87	0,14	-2,08	0,06	-2,23	0,23
OI Present - VL Undetected	0,20	0,97	-0,56	0,59	-0,27	0,82	1,22	0,22	0,83	0,46	0,08	0,93	-1,11	0,51
No OI - VL Detected	-7,93	0,55	-0,17	0,94	-0,27	0,92	1,83	0,42	-1,67	0,52	-2,33	0,29	-5,33	0,17
No OI - VL Undetected	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na

Abbreviations. Opportunistic infections (IO); viral load (VL); estimate (Est); pValue (p).

DISCUSSION

Predictors of quality-of-life HIV patients that both viral load and the number of opportunistic infections are correlated with the quality-of-life among people living with HIV, with viral load showing a weaker correlation and the number of opportunistic infections showing a moderate correlation. The synergetic analysis found that the presence of a detected viral load and the existence of opportunistic infections among people living with HIV was associated with a significant reduction in their

quality-of-life. Additionally, the study found that the social relationship and environment domains of the quality-of-life were the most impacted by viral load, suggesting that these areas were susceptible to the effects of the virus.

The findings of this study are consistent with prior research that also identified a significant correlation between viral load and the quality-of-life among individuals living with HIV (Ahmed et al., 2021; Ferreira et al., 2012; Mohammad Reza et al., 2020). This result reinforces the trend of viral load as an indicator of the quality-of-life in HIV patients (Mylonakis et al., 2001). Viral load is one of the examinations used to determine the survival prognosis in HIV patients. A detected viral load signifies a high concentration of the virus in the bloodstream, which subsequently contributes to the reduction of T-CD4 lymphocytes (Astari et al., 2009). This condition can create a vulnerability to new infections, potentially impacting overall health and well-being and consequently affecting the quality-of-life (Baker et al., 2022; Kumah et al., 2023).

In this study, it was found that patients with detected viral load experience a decrease in their quality-of-life in the social relationship and environmental domains. The social domain assesses positive feelings, thinking, learning, memory concentration, self-esteem, and body image. At the same time, the environmental domain assesses perceptions of physical safety, living conditions, income, access to quality services, access to information, leisure, physical environment, and transportation.

In their research, (Fumaz et al., 2019) stated that negative mood associated with HIV condition, low satisfaction with body image, emotional distress, lack of coping strategies, and the prevalence of rejection and stigma in society lead to low quality-of-life in women with HIV. Stigma related to HIV still exists in society. Situmeang et al. (2017) research on HIV knowledge, it was revealed that 71.63% of respondents experienced stigma. This stigma affects the psychological well-being of HIV patients and can trigger depression (Vanable et al., 2006). Stigma is a social problem that affects the psychological well-being of patients, which can cause them to delay or refuse HIV treatment and can even lead to non-compliance with ongoing ARV treatment (Aswar et al., 2020; Situmeang et al., 2017).

Someone with a lower viral load will have a longer progression time to AIDS. HIV infection reduces CD4 function, indicating an increase in CD4 that can progressively lower immunity (Daramatasia, 2019) . Increased viral load will lead to physical, social, and emotional issues. People living with HIV/AIDS (PLWHA) often experience severe fatigue, persistent fever, significant weight loss, drastic muscle mass reduction, and overall weakness. PLWHA may face difficulties in carrying out daily activities and tasks to the extent that, in some cases, they may be unable to work (Perazzo et al., 2017; Webel Ar Fau - Jenkins et al., 2019). The difficulties experienced by PLWHA in carrying out their daily activities indicate a decrease in their quality-of-life (Bukhori et al., 2022; Jesus et al., 2017; Xu et al., 2017).

No association between opportunistic infections and quality of life. In India, it is stated that the absence of opportunistic infections and higher CD4 counts contribute to a higher quality-of-life (Arjun et al., 2017). The lack of correlation between quality-of-life and opportunistic infections may be because patients have accepted and adapted to their illness, allowing them to manage opportunistic infections effectively. Someone who can adapt to stressors demonstrates emotional openness and awareness and can provide valuable learning experiences (Fteiha & Awwad, 2020; Nasir et al., 2023; Sitorus et al., 2023). This will improve coping behaviors towards the illness and enhance the quality-of-life. An increase in antibodies in patients is one factor that can accelerate the healing process.

The study also found that most patients were involved in the HIV Peer Support Group. These Peer Support Groups are one form of social support that helps HIV patients with their

needs related to ARV services, providing information and education and sharing experiences among patients regarding adherence to ARV medication. They also serve as a platform for mutual support in ARV treatment, sharing experiences related to adherence to ARV medication and providing information and education (Edi & Isna Ratri, 2023; Iryawan et al., 2022; Misutarno et al., 2022). In this study, the support received by patients can motivate them to adhere to ARV treatment, thereby suppressing the patient's viral load.

This study possesses several strengths. Up to this point, it represents the first investigation that assesses the correlation between viral load, opportunistic infections, and quality-of-life among people living with HIV in Indonesia. This study employs objective measurements, specifically viral load and opportunistic infections. The viral load was evaluated on the same day as the quality-of-life measurement. Healthcare professionals also diagnosed opportunistic infections using supportive measurements. While this study boasts these strengths, certain limitations must also be considered when interpreting the results. The study's participant pool includes only individuals with at least one year of anti-retroviral (ARV) treatment. It could be beneficial to extend the research to include or compare individuals living with HIV who have undergone ARV treatment for less than a year.

CONCLUSION

This study found viral load as a significant moderator for quality-of-life among people with HIV/AIDS. Although not statistically significant, opportunistic infection had a clinical effect on quality-of-life. The results of viral load testing and the identification of opportunistic infections can serve as potential indicators to assess the quality-of-life among people living with HIV.

The outcomes of this study have practical implications for enhancing healthcare services in clinical settings. This information can guide the implementation of targeted interventions to strengthen social relationships and these individuals' environmental quality-of-life.

SUGGESTIONS

Since quality of life and health outcomes can vary over time, a longitudinal approach might provide a more dynamic view of how changes in viral load and infections impact quality of life. This recommendation could be noted for future research.

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DECLARATION OF CONFLICTING INTEREST

We declare that we have no conflicts of interest to this research study.

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AUTHOR CONTRIBUTION

Rina Yuliaty: Conceptualization, Data curation, Formal analysis, Software, Visualization, Writing - original draft

Rohman: Conceptualization, Supervision, Validation, Writing - review and editing

Fitrian Rayasari: Validation, Writing - review and editing

Dian Noviati Kurniasih: Validation, Writing - review and editing

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