

ARTICLE INFORMATION

Received: August 09, 2026

Revised: August 25, 2026

Available online: August 27, 2026

at: <https://e-jurnal.iphorr.com/index.php/mchc>

Association of age and marital status with viral load among people living with HIV

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Abstract

Background: Human Immunodeficiency Virus (HIV) remains a global health problem, including in Indonesia. One of the main indicators used to monitor disease progression and evaluate the success of antiretroviral (ARV) therapy is viral load testing. Viral load is the main indicator in monitoring the success of antiretroviral (ARV) therapy in people with HIV/AIDS (ODHIV). Viral load results can be influenced by various factors, including age and marital status. Therefore, it is necessary to know the relationship between these two factors with viral load test results in ODHIV.

Purpose: To determine the relationship between age and marital status with viral load test results in ODHIV patients.

Method: This study used an observational analytical design with a retrospective approach. The study sample was 67 ODHIV patients who met the inclusion criteria with a total sampling technique. Data were obtained from patient medical records for the period 2024-2025. Analysis of the relationship between age and viral load used the Spearman rank test, while the relationship between marital status and viral load used the chi-square test.

Results: The majority of respondents were teenagers (44.8%), male (91.0%), single (98.5%), and had undetectable viral load results (80.6%). The analysis showed a significant relationship between age and viral load ($p=0.038$; $r=0.254$) and between marital status and viral load ($p=0.006$; $r=0.398$).

Conclusion: There is a significant relationship between age and marital status with viral load test results in ODHIV patients. Demographic and social factors play a role in achieving viral load suppression in ODHIV.

Keywords: Age; HIV; Marital Status; ODHIV; Viral Load.

INTRODUCTION

HIV/AIDS remains a significant global and national public health problem. The World Health Organization (WHO) estimated that 38.4 million people were living with HIV (PLHIV) worldwide at the end of 2021 (Sukarya et al., 2023). In Indonesia, the cumulative number of AIDS cases has reached 121,101 (Sutrasno, 2022). In the Special Region of Yogyakarta, particularly Sleman Regency, the number of cases increased from 2,027 in 2024 to 2,157 in 2025, indicating that HIV transmission is still ongoing (Salbila & Usiono, 2023). As a control measure, combination antiretroviral (ARV) therapy is globally recommended to suppress viral replication,

increase CD4 lymphocyte counts, and prolong patient survival, although it is not curative (Susanti, Nuryastuti, & Ikawati, 2024). The World Health Organization (WHO) recommends a combination of Tenofovir disoproxil fumarate (TDF), Lamivudine (3TC), and Dolutegravir (DTG) (TLD) as the preferred first-line regimen for people living with HIV because of its high efficacy in suppressing viral load, high genetic barrier to resistance, and favorable safety profile (World Health Organization, 2019).

The primary parameter and gold standard for evaluating virological response, monitoring disease progression, and detecting ARV treatment failure at

an early stage is viral load testing, which measures the amount of HIV RNA in the blood (copies/mL) (Nada et al., 2024). Achieving viral load suppression to the lowest possible level is crucial because it directly contributes to treatment success and reduces the risk of HIV transmission in the community (Olyvia et al., 2025). However, successful viral load reduction is influenced not only by the clinical characteristics of the medication but also by individual characteristics of PLHIV that affect treatment adherence (Munasir et al., 2026).

Viral load among people living with HIV is influenced by internal factors, including age, immune status (CD4 cell count), disease stage, opportunistic infections, ARV resistance, and individual genetic and immune responses, which affect the body's ability to suppress viral replication (Hormigo et al., 2021). External factors include adherence to ARV therapy, access to healthcare services, social support, marital status, and socioeconomic and educational conditions, all of which contribute to treatment success and the achievement of viral load suppression (Astari et al., 2009).

Patient characteristics, such as age and marital status, are closely associated with disease progression and immune response (Sohail et al., 2022). Increasing age is associated with a decline in immune function (immunosenescence), which may accelerate the severity of infection and slow the response to treatment, whereas younger age groups generally demonstrate a more optimal viral suppression response to antiretroviral therapy (ART) (Jin et al., 2025).

Marital status has been significantly associated with viral load suppression ($p < 0.05$), as the presence of a partner may provide emotional support, medication-taking supervision, and social stability, thereby strengthening treatment adherence (Olawejaju et al., 2025). Given the limited number of studies examining the relationship between individual characteristics and viral load outcomes at the primary healthcare level, this study is important to support the optimization of clinical services and HIV control strategies at community health centers (Sohail et al., 2022).

RESEARCH METHOD

This study employed a quantitative analytical design with a cross-sectional approach to determine the relationship between age and marital status and viral load test results among people living with HIV (PLHIV). The study obtained permission from Community Health Center X, Sleman, Yogyakarta, and ethical approval from the Health Research Ethics Committee of Universitas 'Aisyiyah Yogyakarta, under approval number 5433/KEP-UNISA/V/2026. The study was conducted at Community Health Center X, Sleman, Yogyakarta, using patient medical record data from the 2024-2025 period.

The study population consisted of all PLHIV who underwent viral load testing at Community Health Center X, Sleman, Yogyakarta. The sample was selected using total sampling, whereby all patients who met the inclusion criteria were included in the study. The inclusion criteria were PLHIV who were registered and actively receiving HIV/AIDS services at Community Health Center X, Sleman, Yogyakarta; receiving antiretroviral (ARV) therapy; having viral load test results; having complete characteristic data, including age and marital status; and being recorded during the 2024-2025 period. The exclusion criteria included PLHIV with incomplete characteristic data, those who had transferred to another healthcare facility or discontinued care at Community Health Center X, Sleman, Yogyakarta, before viral load testing, and patients experiencing severe opportunistic infections or acute illnesses that could potentially affect viral load results, such as active tuberculosis, severe candidiasis, Pneumocystis pneumonia, toxoplasmosis, Kaposi's sarcoma, cytomegalovirus (CMV) infection, and cryptococcal meningitis.

The data used were secondary data obtained from patient medical records. The collected data underwent editing, coding, and cleaning before being analyzed using SPSS. Univariate analysis was performed to describe the characteristics of the respondents and viral load results. Bivariate analysis was conducted using the Spearman rank test for age and Fisher's exact test for marital status, with a significance level of $p < 0.05$.

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DOI: <https://doi.org/10.56922/mchc.v5i5.4063>

RESEARCH RESULTS

Table 1. Characteristics of Respondents (N=67)

Age Group	Undetectable (<50 Copies/mL)	Low (50–999 Copies/mL)	Moderate (1.000–100.000 Copies/mL)	High (>100,000 Copies/mL)
Adolescents (15-25)				
Unmarried	26/86.7	1/3.3	2/6.7	1/3.3
Married	0/0	0/0	0/0	0/0
Early adulthood (26-35)				
Unmarried	23/88.5	2/7.7	1/3.8	0/0
Married	0/0	0/0	0/0	0/0
Middle adulthood (36-49)				
Unmarried	4/57.1	0/0	3/42.9	0/0
Married	0/0	0/0	0/0	0/0
Late adulthood (≥50)				
Unmarried	1/33.3	1/33.3	1/33.3	0/0
Married	0/0	1/100.0	0/0	0/0

Based on the table 1. most respondents were in the adolescent group (15–25 years), comprising 30 respondents (44.8%), followed by the early adulthood group (26–35 years) with 26 respondents (38.8%). Most respondents were unmarried. Among adolescents, the majority had an undetectable viral load, with 26/86.7% of respondents, while 1/3.3% had low viral load, 2/6.7% had moderate viral load, and 1/3.3% had high viral load. In the early adulthood group, most respondents also had an undetectable viral load (23/88.5%), followed by low viral load (2/7.7%) and moderate viral load (1/3.8%). No respondents had a high viral load. Among respondents aged 36–49 years, 4/57.1% had an undetectable viral load, while 3/42.9% had a moderate viral load. In the ≥50 years group, the unmarried respondents showed an equal distribution of undetectable, low, and moderate viral loads (1/33.3% each). Among married respondents, 1/100% had a low viral load. Overall, the findings indicate that most respondents had an undetectable viral load, particularly those in the adolescent and early adulthood groups.

Table 2. The Relationship Between Age and Marital Status and Viral Load

variable	p-value	r
Age	0.038	0.254
Marital status	0.090	

The Spearman Rank test showed a significant association between age and viral load among people living with HIV (PLHIV) ($p=0.038$; $r=0.254$). The correlation coefficient of 0.254 indicates a weak correlation between the variables, as it falls within the range of 0.20–0.399.

The Fisher's Exact test showed no statistically significant association between marital status and viral load among PLHIV ($p=0.090$). The correlation coefficient indicated a negative relationship, suggesting that marital status was not associated with variations in viral load.

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DISCUSSION

Based on the study findings, most respondents were adolescents (15–25 years), comprising 30 respondents (44.8%), followed by young adults (26–35 years) with 26 respondents (38.8%), middle-aged adults (36–50 years) with 7 respondents (10.4%), and older adults (≥ 50 years) with 4 respondents (6.0%). Based on viral load test results, the majority of respondents in each age group had undetectable viral loads, namely 86.7% in the adolescent group, 88.5% among young adults, 57.1% among middle-aged adults, and 25.0% among older adults. These findings indicate that most respondents had achieved viral load suppression.

Age may influence viral load results because increasing age is associated with a decline in immune system function, thereby reducing the body's ability to suppress HIV replication. This decline in immune function may impair viral control and consequently increase viral load. In addition, HIV targets CD4 cells, which play an important role in immune function; therefore, viral control may become less optimal in patients with impaired immune status (UNAIDS, 2025).

In younger individuals, the immune system generally functions more optimally, allowing the body to better suppress viral replication. However, successful viral load reduction is not determined solely by immune status but is also influenced by adherence to regular ARV medication, family support, and patients' level of knowledge. When ARV therapy is taken consistently, viral replication can be suppressed, resulting in a low or undetectable viral load (Ayu et al., 2023). The present study demonstrated a significant relationship between age and viral load among PLHIV at Puskesmas Depok II ($p = 0.038$; $r = 0.254$). The correlation coefficient indicates a weak association, suggesting that age is not the only factor influencing viral load.

This finding is consistent with previous research showing a significant association between adherence to ARV therapy and viral load levels ($p = 0.010$), indicating that patients who adhere to treatment are more likely to achieve viral load suppression (Suryanto & Nurjanah, 2021). This finding is also supported by another study reporting that successful viral load suppression is influenced by treatment adherence and other supporting factors, including

duration of ARV therapy, nutritional status, family support, and patients' level of knowledge (Aresta & Jumaiyah, 2019).

The Tenofovir disoproxil fumarate, Lamivudine, and Dolutegravir (TLD) regimen acts rapidly to suppress HIV replication. Viral load reduction generally becomes apparent within the first few weeks after treatment initiation, with a median time to viral load suppression (< 50 copies/mL) of approximately 35 days among most adherent patients. In patients with very high baseline viral loads, suppression may take approximately two months. Therefore, the duration of ARV therapy, combined with high treatment adherence and the absence of treatment interruption, is an important factor in achieving and maintaining viral load suppression (Kityo et al., 2025).

The findings of this study indicate that although age was significantly associated with viral load, its effect was relatively small. Thus, achieving viral load suppression is likely influenced more strongly by other factors, particularly adherence to ARV therapy, duration of treatment, family support, and patients' level of knowledge. Regarding marital status, almost all respondents were unmarried, with married status represented by only one respondent in the older adult group. The predominance of unmarried respondents is consistent with the age distribution of the study population, which was dominated by adolescents and young adults, who in Indonesia are generally unmarried or have only recently entered marriageable age.

Previous research has reported that marital status is not associated with viral load and that unmarried PLHIV may have a higher proportion of viral load suppression than married PLHIV. Nevertheless, marital status was not significantly associated with viral load suppression and therefore cannot be considered a determinant of treatment success (Mirzaei-Alavijeh et al., 2025). This finding is consistent with another study conducted in Nigeria, which also found no significant difference in viral load suppression between married and unmarried individuals. Virological non-suppression among married patients may be influenced by various factors, including inadequate partner support or reluctance to disclose HIV status to a partner because of stigma. Therefore, married PLHIV require optimal

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social support, including medication reminders, emotional support, and efforts to reduce stress during treatment. Positive partner support has been shown to reduce the impact of HIV-related stigma and improve adherence to antiretroviral therapy (ART), ultimately supporting viral load suppression (Zondi et al., 2024).

The findings of this study are also consistent with previous research showing no significant association between PLHIV who have a partner and those who do not. This suggests that successful viral load suppression is more strongly influenced by other factors, such as adherence to antiretroviral therapy, the quality of social support, and engagement with healthcare services, rather than marital status itself (Baker et al., 2021).

This study was also affected by an imbalance in the sample distribution. Of the 67 respondents, only 1 respondent was married, while 66 were unmarried. This substantial imbalance limited the statistical power to detect differences in viral load between marital-status groups. Consequently, the statistical analysis produced a p-value of 0.090, indicating no statistically significant association. Previous research has explained that imbalanced sampling can affect statistical analyses and potentially mask true associations. Therefore, interpretation of the findings should take this substantial imbalance in the data distribution into consideration as an important limitation (Gupta et al., 2022).

CONCLUSION

Based on the findings of the study on the relationship between age and marital status and viral load among people living with HIV (PLHIV), it can be concluded that most respondents were adolescents (15–25 years), comprising 30 respondents (44.8%). The majority of respondents in each age group had undetectable viral loads, with the highest proportions observed among young adults (88.5%) and adolescents (86.7%). Regarding marital status, almost all respondents were unmarried (66 of 67 respondents), with only one married respondent in the older adult group. Bivariate analysis showed a significant relationship between age and viral load among PLHIV ($p = 0.038$; $r = 0.254$), although the strength of the association was weak, indicating that age is not the only factor determining viral load levels. In contrast, no significant relationship was found

between marital status and viral load among PLHIV ($p = 0.090$), which may have been substantially influenced by the imbalance in sample size between the married and unmarried groups.

SUGGESTION

Viral load testing should be performed regularly (e.g., at 6 months, 12 months, and every 12 months thereafter) to monitor treatment success over time rather than assessing it at only a single time point. Other factors that were not examined in this study but warrant further investigation include ARV adherence, family/social support, duration of therapy, nutritional status, patients' level of knowledge, and disclosure of HIV status to family members or partners. For healthcare services, continued education and counseling on ARV adherence are recommended for all PLHIV regardless of marital status.

This study has several limitations. The number of married respondents was very small (1 of 67 respondents), making the analysis of the relationship between marital status and viral load less representative and susceptible to bias. The cross-sectional design also limited the study to assessing conditions at a single point in time and therefore could not establish causal relationships or describe changes in viral load over time. In addition, this study did not measure potentially mediating factors that may have a stronger influence on treatment adherence and viral load, such as ARV adherence, family/social support, duration of therapy, and patients' level of knowledge. Consequently, the underlying mechanisms of the observed relationships could not be explored in greater depth.

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