

**Lama Terapi Antiretroviral terhadap Supresi Viral Load Pasien HIV/AIDS
di Rumah Sakit Daerah Budhi Asih 2023-2025
(Studi Retrospektif)**

***Duration of Antiretroviral Therapy for Viral Load Suppression in HIV/AIDS
Patients at Budhi Asih Regional Hospital 2023-2025
(Retrospective Study)***

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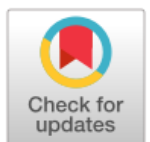
Abstrak

*Human Immunodeficiency Virus (HIV) merupakan virus yang menyerang sel darah putih. Virus HIV terus bereplikasi akan mempercepat progresi menuju tahap Acquired Immuno Deficiency Syndrom (AIDS), yang mengakibatkan penurunan sistem kekebalan tubuh. Terapi ARV diberikan untuk menghambat replikasi virus dalam darah tersupresi hingga mencapai jumlah virus yang sangat rendah atau berada dibawah batas deteksi dan terapi ARV dapat meningkatkan sistem imun pada pasien HIV. Pemantauan keberhasilan terapi dilakukan melalui pemeriksaan kadar viral load dan kadar viral load status tersupresi. Penelitian ini bertujuan untuk melakukan analisis hubungan antara lama terapi ARV terhadap supresi viral load pasien HIV/AIDS. Penelitian ini menggunakan desain *cros-sectional* dari sumber data rekam medis sebanyak 76 penderita HIV/ AIDS yang menjalani terapi ARV selama 6 bulan dan 12 bulan periode Januari 2023-Desember 2025. Pengambilan sampel penelitian dilakukan secara probability sampling dengan metode acak sederhana (simple random sampling). Hasil penelitian diperoleh pasien HIV/ AIDS 76.3 % banyak pada laki-laki dengan 71.1 % kelompok usia 25-49 tahun. Frekuensi kadar viral load pada terapi 6 bulan 203413 kopi/mL terjadi penurunan setelah terapi 12 bulan menjadi 5670 kopi/mL. Hasil analisis *Chi-Square* diperoleh pasien yang mengalami status kadar viral load tersupresi / tidak terdeteksi virus (<50 kopi/mL), pada terapi ARV 6 bulan sebesar 61.8 % dan mengalami peningkatan status pada terapi ARV12 bulan menjadi 92.1 % pasien. Hasil menunjukan ada hubungan yang signifikan antara lama terapi ARV dan supresi viral load ($p=0,002$). Semakin banyak viral load tersupresi di dalam darah atau virus tidak terdeteksi pada pasien, maka terapi ARV berhasil menghambat replikasi virus. Hasil penelitian ini menjadi bahan evaluasi program klinis objektif mengenai efektivitas program Antiretroviral Therapy (ART) yang telah berjalan selama periode 2023–2025.*

Kata Kunci: ARV ; HIV/AIDS ; Lama Terapi ; Supresi Viral Load

Abstract

Human Immunodeficiency Virus (HIV) is a virus that attacks white blood cells. The HIV virus continues to replicate, accelerating progression towards the Acquired Immuno Deficiency Syndrome (AIDS) stage, which results in a decline in the body's immune system. ARV therapy is given to inhibit viral replication in suppressed blood until it reaches very low virus counts or is below the detection limit and ARV therapy can improve the immune system in HIV patients. Monitoring the success of therapy is carried out by checking viral load levels and suppressed viral load levels. This study aims to analyze the relationship between duration of ARV therapy and viral load suppression in HIV/AIDS patients. This study used a cross-



sectional design from medical record data sources of 76 HIV/AIDS sufferers who underwent ARV therapy for 6 months and 12 months for the period January 2023 - December 2025. Research sampling was carried out using probability sampling with a simple random sampling method. The research results showed that 76.3% of HIV/AIDS patients were men with 71.1% in the 25-49 year age group. The frequency of viral load levels during 6 months of therapy was 203413 copies/mL, decreasing after 12 months of therapy to 5670 copies/mL. The results of the Chi-Square analysis were obtained by patients who experienced suppressed/undetectable viral load status (<50 copies/mL), at 6 months of ARV therapy, it was 61.8% and experienced an increase in status at 12 months of ARV therapy to 92.1% of patients. Conclusion there was a significant relationship between duration of ARV therapy and viral load suppression ($p=0.002$). The more the viral load is suppressed in the blood or the virus is not detected in the patient, the more successful ARV therapy is in inhibiting viral replication. The results of this study serve as material for an objective clinical program evaluation regarding the effectiveness of the Antiretroviral Therapy (ART) program that has been running for the period 2023–2025.

Keyword: ARV ; HIV/AIDS ; Length Of Therapy ; Viral Load Suppression

1. Introduction

HIV is a virus that attacks the human immune system. This virus attacks white blood cells, especially T lymphocytes or CD4. HIV infection can cause AIDS, which occurs because the human immune system is damaged by HIV infection (Gumariato RS et al., 2022). HIV-AIDS is the final and most severe stage of HIV infection. HIV/AIDS patients who do not receive treatment will infect other people and on average die within one to three years and can reach nine years (Suhaimi, et al., 2019).

One of the steps taken by the government in dealing with HIV/AIDS cases in Indonesia is towards achieving three zeroes, namely zero new infections, zero AIDS-related deaths and zero stigma and discrimination. To achieve this goal through treatment, ARV therapy is known as Strategic Use of Antiretrovirals (SUFA). The aim of ARV therapy is to reduce the risk of transmission, inhibit the worsening of infection, inhibit viral replication so that the virus in the blood is suppressed to reach a very low amount of virus or below the detection limit. ARV therapy can improve the immune system and improve the quality of life of HIV sufferers (Trisna C et al., 2022). The use of ARV drugs must be carried out consistently even though the sufferer feels better, because if you stop taking it, the HIV virus will become resistant to ARV drugs, CD4 lymphocytes will decrease, health will decline, the severity of infection and death will occur (Kemenkes RI, 2015). The use of ARV drugs cannot completely cure HIV but can improve the sufferer's quality of life (Yudhi Tri Gunawan IP, Mury Ririant, 2016).

HIV patients who receive ARV therapy for 6 to 12 months need clinical monitoring of therapy by a doctor. One of the monitoring measures is virological examination such as viral load examination. Viral load examination is carried out to identify failure more quickly and precisely compared to monitoring through clinical signs and immunological examination (Kementerian Kesehatan RI, 2019). Viral load is an examination that determines the amount of HIV virus present per milliliter of blood of HIV/AIDS sufferers, expressed in "copies" units. Viral load examination is carried out with the aim of finding out health information and how effective ARV therapy is in suppressing the virus in the body. According to the Indonesian Ministry of Health, the results of the viral load examination must show optimal results, namely that no virus is detected in the body (units <50 copies/mL of blood) so that clinical status improves, antibodies can increase so that the risk of transmission decreases (Dewanti E, 2021). However, if the viral load test results are >50 copies/ml of blood, then the results are in the "not suppressed" category. The more HIV virus in the blood, the higher the viral load. This condition shows that there is still a virus in the body and evaluation of antiretroviral treatment is needed to maximize suppression (Kemenkes RI, 2023). As the results of the study showed that there was adherence to taking ARV medication after 12 months with viral load levels, it

showed that there was a significant relationship in "Men who have sex with men" (MSM), were infected with HIV, $p = 0.001$, and patients who do not adhere to taking ARVs have a 22.5 times chance of their viral load increasing or being detected (Muhammad Syafei Hamzah Femaasek, 2019). In contrast to the results of research conducted by Farid Kurniawan et al with subjects as many as 197 HIV patients, 68.5% of whom were men aged 18-61 years who received ARV therapy guidance with good treatment compliance, stating that as many as 21 subjects experienced virological failure, namely viral load > 400 copies/mL (Farid et al., 2017).

Viral load is a medical term that indicates the number of copies of the virus's genetic material (HIV RNA) in each milliliter (mL) of a patient's blood sample. This test is a direct indicator of how actively the HIV virus is replicating in the body. Urgency of Examination as a basic determinant (Baseline Data) is carried out when the diagnosis is first made to determine the severity of the infection before treatment begins (Hilma et al., 2023). Examination of the HIV RNA viral load plays an important role in the course of HIV infection and is the basis for disease management. Currently, viral load checks are increasingly being carried out by clinicians. Viral load measurements are carried out several months after the seroconversion phase or what is known as "baseline". Viral load is an important predictor of the progression of HIV infection to AIDS. Regular viral load measurements help patients and physicians determine the appropriate time to start antiretroviral therapy, evaluate the effectiveness or failure of therapy, and ensure that the benefits of antiretroviral therapy are achieved, otherwise therapy treatment needs to be changed. Apart from that, viral load testing is also very useful for individuals who have recently been exposed to HIV or have experienced an acute infection, even though antibodies have not yet been formed. Serological examination is still needed to confirm an HIV diagnosis (Hilma et al., 2023).

The relationship between ARV therapy and viral load levels involves a pathophysiological mechanism in which the mechanism of action of this ARV drug is by inhibiting HIV reverse transcriptase, so that the growth of the DNA chain and HIV replication stops, inhibiting the transcription of HIV RNA into DNA, an important stage in the process of viral replication and inhibits HIV protease which prevents viral maturation (Putri et al., 2022).

The novelty of this study is contextual and temporal: this study uses the latest post-pandemic data (2023–2025). Trends in treatment adherence, antiretroviral (ARV) drug logistics management, and psychological patterns of HIV/AIDS patients in the current era of national health recovery have significantly different characteristics compared to data from the pandemic era (2020–2022) or pre-pandemic. This study offers novelty because it evaluates the relationship between therapy duration and viral load suppression in a clinical ecosystem already dominated by TLD regimens (known to have faster viral suppression efficiency than the older efavirenz).

This research was conducted to assess the success or failure of treatment more quickly by providing ARV therapy to HIV/AIDS sufferers for a period of 6 to 12 months according to the government's treatment case management. The success of therapy can be seen from checking that viral load levels have decreased, while levels of suppressed viral load in the blood, which are reported in units of <50 copies/mL of blood, are getting higher. The more the viral load is suppressed in the blood or the virus is not detected in the patient, the more successful ARV therapy is in inhibiting viral replication.

Research using secondary data on the results of viral load examination has the first function, as a prognosis, namely the viral load helps estimate how long we will remain healthy, the higher the viral load, the faster opportunistic infections develop. The second function as prevention is that the viral load shows the ability to infect other people, the higher the viral load, the easier it is to transmit HIV. The third function is monitoring ARV therapy, whether ARV therapy can control the viral load (Setyaningsih A, Abror YK, 2024).

2. Methodes

Ethical clearance is issued by the Ethics Commission of the Budhi Asih Regional Hospital with Ethics Review Number: 052/KEP-ETIK/IV/2025. Request a research permit from the agency where the research was conducted. Furthermore, researchers carry out research activities by emphasizing research ethics with an emphasis on health, welfare, maintenance, confidentiality, personal comfort and human dignity. This research was declared ethically appropriate according to WHO 2011 standards and WHO-CIOMS 2026 ethical guidelines.

This research design uses analytical observational with a cross sectional approach. The research subjects were all medical record data of HIV/AIDS patients at Budhi Asih Regional Hospital who underwent ARV therapy for a duration of 6 months and 12 months. The research variables were duration of ARV therapy of 6 months and 12 months as the independent variable and suppressed and unsuppressed viral load levels as the dependent variable. The study's inclusion criteria were patients with HIV infection I who had received first-line AR therapy for at least 6 and 12 months and had undergone viral load testing. Exclusion criteria included patients with opportunistic diseases such as tuberculosis, hepatitis, and HIV patients who had progressed to AIDS within six and 12 months of initiating ARV therapy.

Data Collection and Measurement, using secondary data for 2023-2024 at Budhi Asih Regional Hospital. The population in this study was all data on HIV patients at Budhi Asih Regional Hospital who underwent ARV therapy for 6 months and 12 months. The sample size was determined using the correlation formula (Dahlan MS, 2016). Sampling in this research was carried out using probability sampling using a simple random method (Simple Random Sampling/SRS). This technique is used for random sampling from existing population members according to inclusion criteria and exclusion criteria (Sukwita T, 2023). The sample size was determined using the correlation formula with the number of samples studied being 76 samples Statistical analysis used the Chi-Square Fisher's Exact Test with a confidence level of 95% (α 0.05). The basis for selecting statistical tests such as the Chi-Square and Fisher's Exact Tests is determined by the scale of the data, the type of group relationship (independent/paired), and the number of samples (expected count) in the contingency table. These two tests are used to analyze the relationship between two categorical variables with a 95% confidence level.

3. Result and Discussion

HIV patients based on age and gender characteristics at Budhi Asih Regional Hospital who are undergoing ARV therapy, in table 1 are as follows:

Table 1. Characteristics of HIV Patients Based on Age and Gender

Age	Gender		Percentage	Total
(Year)	Man	Woman	%	N
5-14	1 (1.32 %)	2 (2.63%)	3.9	3
15-19	2 (2.63 %)	2 (2.63 %)	5.3	4
20-24	6 (7.89 %)	0	7.9	6
25-49	43 (56.58 %)	11 (14.47 %)	71.1	54
>50	6 (7.89 %)	3 (3.95 %)	11.8	9
Total	58 (76.%)	18 (23.7 %)	100.0	76

Table 1 shows that most of the age group of HIV sufferers who received ARV therapy were in the 25-49 year age group (71.1%). The gender is dominated by men, amounting to 58 people (76.3%).

The frequency distribution of viral load levels in HIV sufferers who have undergone six months and 12 months of ARV therapy is in table 2 below:

Table 2. Viral Load Levels in HIV Patients with ARV Therapy 6 Months and 12 Months

Length of Therapy (Month)	Viral Load Levels		Mean	SD
	Max	Min		
6	203413	39	10957.32	4436.70
12	5670	0	182.47	98.190

Table 2, the frequency distribution of viral load levels in 6 months of ARV therapy still shows a viral load level of 203413 copies/mL. Furthermore, after 12 months of therapy, the viral load level decreased to 5670 copies/mL and the minimum value reached 0 copies/mL.

HIV patient viral load levels are classified based on the 2022 Minister of Health Regulations with suppressed and unsuppressed status in patients undergoing 6-month and 12-month ARV therapy, the results are in table 3 below:

Table 3. Viral Load Levels for HIV Patients with Suppressed and Unsuppressed Status

Length of Therapy (Month)	Viral Load Levels	
	Suppressed (<50 copi/mL)	Not Suppressed (>50 copi/mL)
6	47 (61.8%)	29 (38.2%)
12	70 (92.1%)	6 (7.9%)

Table 3, HIV patients on ARV therapy during the first six months experienced suppressed status or no detectable virus. Then at the 12th month of therapy there was an increase to 70 patients with suppressed viral load levels or the virus was no longer detectable.

The results of the significance test analysis were to determine the relationship between length of therapy and viral load suppression status by carrying out the Chi Square test using the Fisher's Exact Test with a confidence level of 95% ($\alpha < 0.05$). The results of the test analysis in table 4 are as follows:

Table 4. Analysis Test Results

Fisher's Exact Test	Sig
	<0.002

The results of the Chi-Square test analysis using Fisher's Exact Test obtained $\text{sig} < 0.002$, this value is smaller than $\alpha < 0.05$. The results of this analysis show that there is a significant relationship between the length of treatment and viral load suppression until it is undetectable.

Discussion

In table 1, the results of the analysis of HIV sufferers undergoing ARV therapy were mostly men, 76.3%. The results of this analysis are in line with research by Mukhlis et al., 2023 which states that the number of male HIV patients is higher than female. The increase in the number of HIV cases in men is mainly caused by homosexual relationships, men who have sex with men (MSM). MSM is ranked third as a factor causing HIV (Mukhlis A et al., 2023).

Other research results also state that gender is a factor that can influence viral load results through biological and behavioral mechanisms. Biologically, women's and men's bodies have different immune responses due to the influence of sex hormones and genetic expression. Exterogenous hormones in women have an immunomodulatory effect that can increase immune activity, including the response to HIV virus infection. Several genes involved in immune regulation are on the X chromosome, there are more of them than women, so they can increase natural immune defenses (Scully EP, 2018).

Gender differences also influence the pharmacokinetics of ARV drugs, such as differences in liver metabolism, body fat distribution, and body fluid volume, which can influence drug concentrations and therapeutic effectiveness (Dila Qhoirul Nisa, Salman, 2022). Behaviorally, women and men show different patterns of compliance with therapy. Women are generally more compliant with treatment and visit health facilities more regularly. In contrast, men tend to delay seeking treatment and more frequently experience treatment discontinuation, which may impact the success of viral load suppression. Thus, the influence of gender on viral load suppression is not only influenced by biological factors, but also complex social and behavioral factors (Putria W et al., 2024).

Grouping of patient age characteristics based on reports on the development of HIV/AIDS and Sexually Transmitted Infections for Quarter 1 of 2023 by the Directorate General of Disease Prevention and Control, Ministry of Health of the Republic of Indonesia. The results of the analysis of this research were many sufferers aged 25-49 years, 71.1%. This finding is in line with the Ministry of Health's 2023 report which shows that the productive age group dominates HIV cases. This is an indication that the productive age has challenges in undergoing therapy consistently, both psychological factors, lack of understanding, and social stigma. This research is also in line with research conducted by Hilma et al., 2023, 83.4% of HIV patients were in the 20-49 year age group. In this age range, individuals tend to be more sexually active and more easily influenced by social changes, at higher risk of promiscuous behavior that can increase HIV transmission (Yuniar Thamrin H, 2023). This age group is the largest contributor to HIV cases in Indonesia. Biologically, individuals in this age range have a relatively stable immune and metabolic system, so they have the potential to have a good response. However, in this group risk behavior and lifestyle factors are high, such as unsafe sexual relations, use of needles, and involvement in key populations (Kemenkes RI, 2023).

The patient's viral load level after undergoing ARV therapy for six months showed a viral load level of 203413 copies/mL, and decreased after 12 months of therapy to 5670 copies/mL, and reached a minimum value of 0 copies/mL or undetectable. In accordance with Minister of Health Regulation Number 23 of 2022 concerning Control of HIV/AIDS and STIs, viral load levels <50 copies/mL are used as an indicator of viral suppression. In the sixth month of therapy, 45 patients (61.8%) had reached a suppressed condition. This number increased in the 12th month, with 70 patients (92.1%) reaching viral suppression, while only six patients had not yet reached suppressed conditions. The results of this study are in line with Denih A et al., 2021, there were 90.25% viral load profiles after ARV therapy showing undetectable results <40 copies/mL. (Denih A et al., 2021).

The results of the Chi-Square test analysis showed a significant relationship between the duration of ARV therapy and the suppression of viral load levels in the blood of HIV/AIDS patients, $p < 0.001$, meaning that if sufferers routinely carry out ARV therapy continuously for life, the viral load levels will become increasingly undetectable. ARV therapy that is carried out consistently throughout life will help suppress the virus to an undetectable level. The more the virus is suppressed for a long time, it can improve immune function and overall quality of life, reduce the risk of AIDS complications, increase life expectancy and reduce the risk of HIV transmission (Kemenkes RI, 2019).

This research is also in line with Mukhlis et al., 2023, providing results ($p = 0.001$) showing a significant relationship between adherence to ARV therapy and viral load levels (Agus Setiawan Putra M, 2022). Apart from that, this research is also in line with research conducted by Nurye Seid Muhie in 2024 in Ethiopia which obtained an Odds Ratio value of 1.87. This value shows that patients who have undergone ARV therapy for more than 12

months have an 87% greater chance of achieving an undetectable viral load than those who have just started therapy (Muhie NS, 2024).

At the sixth month, 47 patients had achieved viral load suppression <50 copies/mL, there were 29 patients who had not achieved maximum viral load suppression. This shows that ARV therapy is not completely effective in suppressing the virus in the first six months of ARV therapy. After the 12th month the number increased to 70 patients achieving viral load suppression <50 copies/mL. This shows that 70 patients managed to achieve virological success, namely the success of treatment in reducing the number of viruses to undetectable viral load. The main factor in achieving successful therapy is patient compliance with treatment, including taking medication consistently, on time and never stopping. Compliance with ARV therapy is the most important factor in reducing the number of HIV viruses. Long and stable suppression of the number of viruses aims to ensure that the body's immune system remains optimally maintained (Karyadi TH, 2017).

The results of the research analysis showed that the majority of patients (92.1%) succeeded in achieving viral load suppression. However, there were six patients who had not shown an optimal response to ARV therapy. Viral load that has not been suppressed after 12 months of therapy can be caused by several factors, including irregular drug consumption, allergies to drugs, resistance to drugs, and side effects that make patients stop treatment resulting in drug withdrawal (Santoso R et al., 2024).

The level of compliance is the main key to the success of therapy. When patients are not disciplined in taking ARVs, control of the virus can be lost, marked by the return of the viral load from previously undetectable to detectable again. This condition can trigger drug resistance, limit future therapeutic options, and incur greater costs (Nachega JB et al., 2014). Virological failure is an early indicator that the combination of ARV drugs used is no longer effective. If this condition continues, it can develop into immunological failure, followed by clinical failure. In the clinical stage, patients generally begin to experience opportunistic infections due to a weakened immune system. This occurs because the number of CD4 lymphocytes is decreased by the HIV virus which has become resistant to the first-line ARV regimen. Therefore, viral load examination is considered the gold standard in accurately detecting early treatment failure. If the patient is declared to have failed first-line treatment, they need to be immediately switched to second-line ARV therapy (Karyadi TH, 2017).

Limitations The retrospective study design relies heavily on the completeness and accuracy of data recording in patient medical records at Budhi Asih Regional Hospital for the period 2023–2025. Researchers were unable to control for unrecorded variables, such as unreported loss to follow-up, clinical data input errors, or unrecorded transfers to health facilities. This study was conducted locally at a single health center, Budhi Asih Regional Hospital, with a specific urban patient population. Therefore, the results of this study may not be directly generalizable to HIV/AIDS patient populations in other areas with different geographic access, laboratory facilities, and sociodemographic characteristics.

4. Conclusion and Suggestions

Conclusion

There is a significant relationship between duration of ARV therapy and viral load suppression ($p = 0.002$). Based on gender characteristics, the majority of HIV sufferers are men at 76.3% and based on age characteristics, the majority are aged 25–49 years at 71.1%. Viral load levels in the first six months were found to be a maximum of 203,413 copies/mL and a minimum of 39 copies/mL, while viral load levels for the same patient in the 12th month were obtained with a maximum of 5670 copies/mL and a minimum of 0 copies/mL (undetectable). The majority of patients have achieved suppression status with viral load levels at the sixth month being 61.8%, then at the 12th month increasing to 92.1%. Practical implications for healthcare workers close monitoring at the start of therapy, conducting closer clinical monitoring and adherence evaluation in patients with short durations of therapy.

Utilizing Retrospective data for counseling, using the findings of this study as motivational material during counseling, to convince patients that the longer and more compliant they are with their treatment, the greater the chance of the virus in their body being suppressed to the point of being undetectable. Retention in care strategy, developing strategies or reminder media (such as SMS/WhatsApp gateways or special applications) to reduce the rate of drug discontinuation (loss to follow-up), so that patients can achieve the optimal duration of therapy for immune suppression.

Suggestions

Suggestions for further research to look at the relationship between age of HIV/AIDS sufferers, level of compliance and duration of ARV therapy, on outcomes virological (viral load) and immunological (CD4) examination. Apart from that, disturbing factors need to be considered such as the presence of opportunistic infections and a history of possible drug withdrawal affects the effectiveness of therapy and laboratory test results.

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