THE RELATIONSHIP BETWEEN THE TIME OF USE OF ANTIRETROVIRAL THERAPY (ART) AND THE AMOUNT OF VIRAL LOAD IN ACQUIRED IMMUNODEFICIENCY SYNDROME

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ABSTRACT

Objective: Human Immunodeficiency Virus (HIV) that causes acquired immunodeficiency syndrome (AIDS) remains a health problem in the world, including in Indonesia, with increasing residents of people living with HIV/AIDS every year. Viral load measurement is a better predictor than clinical or immunological measures to evaluate the success or failure of ART. This study aimed to fig. out the sociodemographic characteristics and the relationship between the duration of antiretroviral therapy and viral load in HIV/AIDS patients.

Methods: A descriptive and analytic study with a retrospective approach was getting through in this research. There were 61 patients included in this study.

Results: As many as 86.89% of men reported having HIV infection. The biggest risk transmission factor through sexual intercourse by 100%. The most commonly used antiretroviral treatment is TDF+FTC+EFV (Tenofovir+Emtricitabine+Efavirenz) by 50,82%. There were 17 patients and 44 with detectable and undetectable results, respectively (p 0.05).

Conclusion: A statistical analysis of the duration of antiretroviral therapy and viral load concluded that the viral load decreases until it is undetectable with the longer use of ART.

Keywords: Antiretroviral therapy, Viral load, Duration of ARV, HIV

INTRODUCTION

Human Immunodeficiency Virus (HIV) is transmitted through sexual intercourse or by sharing injection equipment. However, It cannot be transmitted genetically from mother to child [1]. At the same time, Acquired Immunodeficiency Syndrome (AIDS) is a clinical manifestation of the final stage of HIV infection [2]. This virus targets CD4 T cells and infiltrates CD4 cells by making more virus copies. As a result, there was a substantial reduction in CD4 cells in patients [3]. HIV patients who have not received therapy will continue to decrease the number of CD4 cells in their blood, lower the patient's immune system and increase the opportunistic symptoms [4].

According to WHO, an estimated 37.7 million people will live with HIV by 2022. More than two-thirds of them (25.4 million) are in the African Region and have claimed 36.6 million lives. Based on the statistical results of HIV/AIDS cases reported by the Ministry of Health of the Republic of Indonesia in 2021, the cumulative number of people living with HIV/AIDS (PLWHA) found written up to March 2021 was 427,201 cases, while the cumulative number of AIDS cases reported up to March 2021 was 131,417 cases. Meanwhile, of the 12,923 people tested for HIV in West Sumatra Province, 94 people were living with HIV, and 75 were found to have started receiving ARV therapy [5].

Currently, there is still no drug that can kill the virus that causes AIDS. Still, treatment is used to suppress the replication of the virus in a person's body, namely antiretroviral therapy (ART), which can restore and strengthen immunity to fight opportunistic infections. Although antiretroviral treatment does not cure HIV infection, it effectively maintains viral suppression and reduces morbidity and mortality in patients with HIV infection [6]. Antiretroviral therapy aims to achieve a viral load as low as possible or below the detection limit, known as the undetectable viral load, usually with a combination of three or more highly active antiretroviral therapy (HAART) drugs [7, 8].

The viral load test calculates the amount of HIV in the blood of people with HIV. The viral load test can measure the amount of HIV quantitatively and is often used to determine the effectiveness of

drug therapy used by patients, namely antiretrovirals [9, 10]. A test result that states an undetectable viral load is an expected test result. It is less probable that the virus will spread, so maintaining an undetectable impact after carrying out a viral load test gives hope to people with HIV [10]. In addition, the viral load test has been used to measure the potential for HIV transmission and to see the effectiveness of antiretroviral therapy against AIDS patients [11].

Therefore, a study was conducted to determine the relationship between the duration of antiretroviral therapy (ART) and the viral load of HIV patients in Dr. M. Djamil Padang in 2020 and 2021.

MATERIALS AND METHODS

Research design

The study was conducted through retrospective data collection through the medical records of HIV/AIDS patients in 2020 and 2021 at the VCT Clinic at Dr. RSUP. M. Djamil Padang. The criteria for the data taken were male and female HIV/AIDS patients aged 20 y with complete medical records. Ethical approval was acquired from The Health Research Ethics Committee of RSUP Dr. M. Djamil Padang No LB.02.02/5.7/36/2022

Data collection

The patient's sociodemographic data is collected, including gender, age, education, occupation, and marital status. Data on risk factors for transmission in each patient were also collected to complement the sociodemographic study. Drug use data collected includes the type and combination of drugs, duration of drug use, and the results of the patient's viral load test

Data analyze

The retrospective data collection was performed with a descriptive-analytical approach. All patients receiving ARV were included in this study. Tests carried out to determine the relationship between the duration of antiretroviral use and the patient's viral load were using a linear regression test. In addition, a linear regression test was performed using Statistical Product and Service Solutions (SPSS®).

RESULTS AND DISCUSSION

Based on the research done at the medical record installation and the VCT Clinic, Dr. M. Djamil Padang, the population of patients with a primary diagnosis of HIV at the VCT clinic in 2020 and 2021 was 89.

Therefore, the total number of samples met the inclusion criteria was 61 patients. Table 1 shows that more patients are male than female. Of the total sample of 61 patients, 53 were male (86.89%), while eight were female (13.11%). The sociodemographic description of HIV patients taking antiretrovirals can be seen in table 1.

Table 1: Sociodemographic characteristics of patients with the main diagnosis of HIV/AIDS in Dr. RSUP. M. Djamil padang

Category	Number of patients (n= 61)	Percentage (%)
Gender		
1. Male	53	86.89
2. Female	8	13.11
Age (year)		
1. 20-29	15	24.59
2. 30-39	26	42.62
3. 40-49	18	29.51
4. 50-59	2	3.28
Level of education		
1. Lower	2	3.28
2. Junior high school	4	6.56
3. Senior high school	48	78.69
4. Bachelor	7	11.47
Marital status		
1. Married	27	44.26
2. Not married	34	55.74
Work status		
1. Private sector	37	60.66
2. Government employee	7	11.47
3. Homemaker	4	6.56
4. Unemployment	9	14.75
5. Other	4	6,56

The findings in this study show conformity with the 2021 national HIV/AIDS data released by the Indonesian Ministry of Health, where male patients are the majority of sufferers, with a percentage of 69%. The high number of male patients with the main diagnosis of HIV is thought to be caused by numerous things, one of which is that men have more risky sexual relationships, such as having free sex by having sexual relations with partners who often change. In addition, many men have sexual relations with the same sex and share injecting drugs [12].

At the age of 30-39 y, it is assumed that a person has a financially stable job to meet primary and tertiary needs, such as a lifestyle that is at risk of being infected with HIV. As a result, adults tend to have risky behavior, while those in their 20s tend to be less aware of the risk of HIV/AIDS transmission from a free lifestyle, making it

easy for them to fall into unsafe sex and drugs with unsterile needles [13]. As a result, it is currently estimated that more than 40 million children and adults are infected with HIV worldwide [14].

A person's behavior can be based on the knowledge he has. Therefore, knowledge is one of several factors influencing a person's attitudes and behavior. With correct knowledge about HIV/AIDS, a person is expected to avoid the risky behavior of being infected with HIV [15]. Someone with low education is at risk of 5.3 times less in taking precautions to prevent HIV transmission. In contrast, someone with education can absorb and understand information better, especially health information about preventing HIV transmission [16].

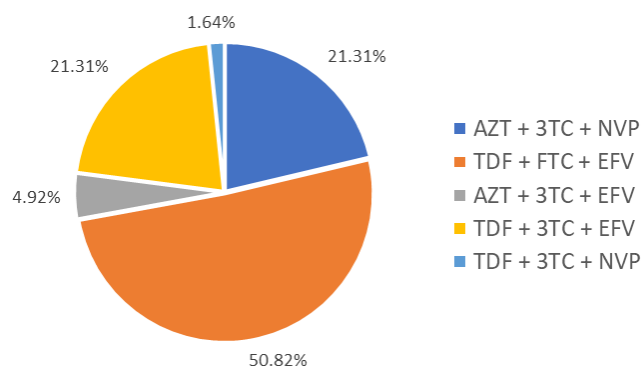Fig. 1 shows the treatment pattern used by the patients in this study.

Fig. 1: Antiretroviral therapy treatment patterns in patients with the main diagnosis of HIV at the VCT Clinic, Dr. M. Djamil Padang; AZT = Zidovudin; 3TC = Lamivudine; NVP = Nevirapin; TDF = Tenofovir; FTC = Emtricitabin; EFV = Efavirenz

This study's administration of different drug regimens was based on drug effectiveness, side effects, patient clinical conditions, drug interactions, and other factors, namely patient compliance. The clinical state of the patient in question, such as using tenofovir

(TDF), is not given to the patient if the creatine clearance test (CCl) count is<50 ml/min or in cases of longstanding diabetes, uncontrolled hypertension, and kidney failure. AZT should also be avoided in patients with Hb<10 d/dl [17]. Instead, more patients

are prescribed Altripla® because it is considered that it will make it easier for patients to take the drug and increase patient compliance, increasing viral load suppression and improving the patient's quality of life. From the data from the study, it can be said that most patients have not experienced resistance in the same ARV class, so ARV treatment is still using the first line. Altripla® is also believed to have higher effectiveness because it has the advantage that three-drug combinations have been combined into one and has a convenient and easy-to-follow medication schedule for patients, one tablet per day. This medication allows patients to adhere highly to medication compared to other drug regimens consumed in large quantities per day [18].

The number of patients with a detectable viral load with prolonged use of antiretroviral therapy is shown in table 2. It can be concluded that the patients with the most detectable viral load were at 0 mo to 6 mo of use. In the period of use, there were ten out of 16 patients whose viral load was detected at 62.5%. It can also be concluded that patients with the highest number of undetectable viral loads were used for seven months to 12 mo. In the period of use, there were 33 patients out of 38 whose viral load was not detectable, which is 86.84%. Of 17 patients whose viral load was detected, the longer the duration of antiretroviral therapy used, the lower the number of patients with detectable viral load.

A viral load examination was carried out at Dr. M. Djamil using the PCR method. This method can detect HIV up to 40 copies/ml. The number of viruses below 40 copies/ml will be detected as not detected. These results indicate that the amount of virus in the patient's body is not detected using the tool [19].

Table 2: Distribution of grouping duration of use of antiretroviral therapy in HIV/AIDS patients with detectable and undetectable viral load in Dr. M. Djamil padang

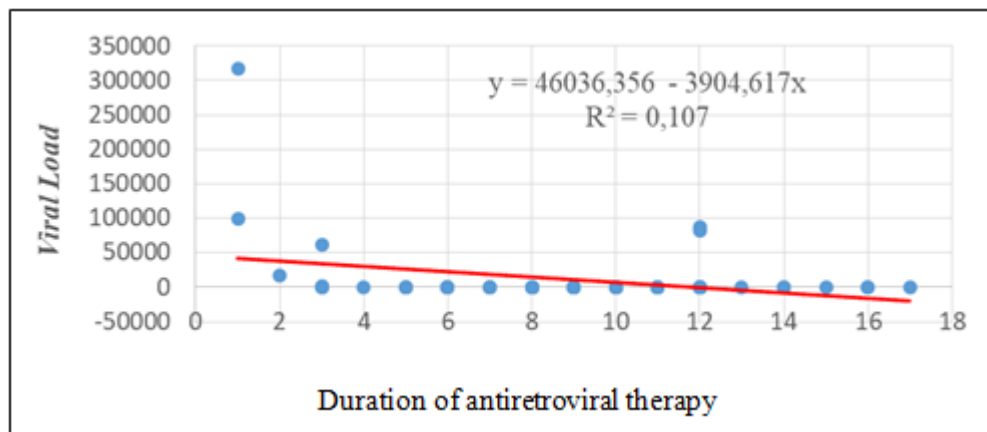| Duration of ARV (months)	Number of patients	*Viral load* detectable		*Viral load* undetectable	
		N	%	N	%
0–6	16	10	62,5%	6	37,5%
7–12	38	5	13,16%	**33**	**86,84%**
13-17	7	2	28,57%	5	71,43%

Fig. 2: Graph of linear regression equation of antiretroviral therapy use with viral load in HIV/AIDS patients

Tests carried out to determine the relationship between the duration of antiretroviral use and the patient's viral load were using a linear regression test. Linear regression test was performed using SPSS (Statistical Product and Service Solutions). The independent variable in this study was the length of use of antiretroviral therapy written in the number of months, and the dependent variable was the viral load value. Therefore, the range of duration of use of antiretroviral treatment used in this study was 0 mo to 17 mo.

In fig. 2, the regression equation y=46036.356-3904.617x can be concluded that using ARVs for 17 mo can reduce the viral load of HIV/AIDS patients by 10.7%. From the regression equation, it can also be interpreted that the longer the use of antiretroviral therapy, the lower the viral load. The x-regression coefficient of -3904.617 states that for every additional 5.1 d of antiretroviral treatment, the viral load value will decrease by 3904.617 copies/ml.

In general, viral load will be undetectable after six months of intensive treatment with ARV [20, 21]. In the data on HIV/AIDS patients at Dr. RSUP. M. Djamil Padang, there were still some patients whose viral load was still detectable even though they had been using antiretroviral therapy for more than six months. Factors that are a risk for this are poor medication adherence, drug resistance, and drug side effects that cause patients to stop taking drugs and lead to drug withdrawal [16]. Medication adherence is a major factor in successfully treating HIV infection. Compliance in question is taking medicines according to the dose, never forgetting, being on time, and never breaking. Compliance with taking ARV is the most important factor in suppressing the amount of HIV in the human body. The long and stable suppression of the number of viruses aims to keep the body's immune system high. Thus, people infected with HIV will get a good quality of life and prevent illness and death [22, 23].

The level of adherence of a patient undergoing treatment must be prioritized because non-compliance in taking ARVs can cause loss of virological control, namely a condition where viral load levels that were initially undetectable become re-detectable due to non-adherence to taking ARVs so that it will result in the emergence of drug resistance and cost of further treatment options and require costs are not small because of the limitations of second and third line ARVs. In addition, factors of non-compliance can also be caused by socioeconomic, low knowledge about health, and lack of health services. In particular, some adolescents and young adult HIV patients have considerable challenges in achieving compliance levels [24].

The use of appropriate drugs is a very important aspect of antiretroviral therapy. Unfortunately, one of the challenges in treating HIV infection is the established resistance to antiretroviral drugs. This resistance requires immediate treatment by optimizing

medication compliance, conducting drug resistance studies, and monitoring treatment results [25].

According to WHO, compared to clinical and immunological monitoring, virological monitoring using viral load provides a former and more accurate indication of treatment failure and the need to switch from first-line ARVs to second-line ARVs [26]. For example, one study showed that approximately 70% of patients taking first-line ARVs with a high viral load would experience a decrease in viral load after receiving adherence interventions [26, 27].

Some limitations caused this study to be incomplete; for example, the patients in this study were not grouped based on obedient patients only, so patients with poor medication adherence were also included. Suppose this study is limited to only patients with good medication adherence. In that case, the relationship between the duration of antiretroviral therapy and a decrease in the patient's viral load will be even greater. However, this study has the advantage that statistical calculations have been carried out to obtain the optimum point of viral load reduction by using antiretroviral drugs. The weakness of this study is that PCR only assesses the mean viral load but does not measure the resulting variability. Result variability also differed among viruses, as did the relative contribution of each factor to overall variability [28].

CONCLUSION

In resource-limited settings, antiretrovirals must be considered, especially in compliance with use. Based on the regression equation y=46036.356-3904.617x, it can be concluded that using ARVs for 17 mo can reduce the viral load of HIV/AIDS patients by 10.7%. Although this treatment has been shown to provide excellent therapeutic effects, its use must be followed by the right combination of antiretrovirals, good patient compliance, and awareness of unwanted drug interactions.

ETHICAL APPROVAL

Ethical approval was acquired from The Health Research Ethics Committee of RSUP Dr. M. Djamil Padang No LB.02.02/5.7/36/2022

AUTHORS CONTRIBUTIONS

NF is the principal investigator in this study. NF design ideas and techniques in research. YAQ and DAJ collect and rewrite medical record data on worksheets. Furthermore, NF also performs data analysis and writes the manuscript.

CONFLICTING INTERESTS

The author(s) declare no conflict of interest regarding this manuscript.

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