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RESEARCH **Open Access**

Adherence to Antiretroviral Theraphy and Associated Factors Among People Living with HIV in Surakarta

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Abstract
The Human Immunodeficiency virus (HIV) presents a major public health challenge due to its association with high mortality and morbidity rates. Infection HIV occurs when the virus attacks the body's immune system at a cellular level. Without treatment, this can progress to the most advanced stage, Acquired Immune Deficiency Syndrome (AIDS). For people living with HIV (PLWHIV), lifelong treatment with antiretroviral (ARV) medication is necessary. This continuing therapy works to reduce the amount of virus in the blood, lowering the risk of transmission, preventing secondary infections, and improving the patient's general life quality. The success and effectiveness of ARV therapy depends on PLWHIV adherence. Poor adherence to antiretroviral therapy decreases its effectiveness and increases viral replication. Therapy adherence indicates that the patient understands the value of receiving therapy and follows the instructions. Knowledge is an important role in therapy compliance. This cross-sectional study was conducted at the VCT Polyclinic of the Department of Internal Medicine, Dr. Moewardi General Hospital in Surakarta, between April and July 2024. The target population included all patients who received a positive HIV diagnosis. A total of 60 patients from this group were selected to participate using a purposive sampling strategy. Bivariate analysis was then used to investigate the relationship between variables, with the Spearmean Rank statistical test. The study result showed that 21 patients with poor level of knowledge had low compliance (92.9%), followed by patients with intermediate level of knowledge with moderate compliance 10 (60.0%), and patients with high level of knowledge with high compliance 29 (69.4%). A statistically significant, moderately strong positive relationship ($r=0.572$, $p < 0.001$) was found between patient knowledge and adherence to ARV therapy at the VCT polyclinic of Dr. Moewardi Hospital, Surakarta. This suggests that PLWHIV who receive adequately informed patients are more likely to adhere to their treatment plans. Therefore, improving patient compliance requires implementing robust educational programs and conducting further research to uncover other influencing factors.

Keywords: Human Immunodeficiency Virus, People Living with HIV, Adherence, Antiretroviral Therapy.

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1. INTRODUCTION

The Human Immunodeficiency Virus (HIV) is a virus that affects CD4+ T cells and weakens the body's immune system (Yunita, et al., 2023). The most advanced phase of this infection is known as Acquired immune deficiency syndrome (AIDS). AIDS is defined by a range of clinical symptoms and sign that result from the severe immune suppression caused by HIV (WHO, 2023). The virus is considered a significant public health threat due to its high rates of illness and death (Kusumaadhi, et al., 2021). Based on World Health Organization (WHO) estimates, the global HIV landscape at the end of 2022 looked like this: 40.08 milion people were living with the virus, 1.3 million new cases, and 630,000 deaths linked to HIV-related causes (0,485%) (UNAIDS, 2025). The highest rate of HIV prevalence is in Africa (26.3 million people), America (4.2 million people), and Southeast Asia (3.5 million people) (UNAIDS, 2025). Data from the year 2012 shows there were approximately 350,000 new HIV infections worldwide. A notable concentration of these cases, sixty-four percent, was observed among men in the Asia Pacific region (Putra, et al., 2021). Indonesia faces a significant challenge with rising number of new HIV infections. This trend is highlighted by data showing that a cumulative total 419,551 cases were reported in the country between 2005 and the end of December 2020 (Minister of Health of the Republic of Indonesia, 2021). A significant treatment and awareness gap exited for HIV in Indonesia as of late 2022. While estimated 543,100 people were living with the virus, nearly 150,000 were undiagnosed. Of the 393,538 who knew their status, less than half (160,249) were on therapy. The outcome was a low viral supression rate, with only 14% reporting a decreased viral load in the past six mont (Nursalam, et al., 2024). HIV cases in Surakarta City in 2022 amounted to 124 cases. The number of cases increased by 47 (0,610%) compared to 2021 (Wahyuningsih, 2022).

HIV infection has become a chronic illness that can be managed through consistently antiretroviral (ARV) therapy. Successful HIV therapy is highly associated with high adherence (95% or above). Noncompliance with ARV treatment raises the chance of resistance to first-line ARV (Zahra, et al., 2024). Antiretroviral therapy is a medical treatment for HIV infection aimed to decrease HIV transmission rates, improve quality of life, maintain immune function, reduce viral load in the blood (Afriana, et al., 2022). Antiretroviral is very important for HIV/AIDS patients because they prevent the onset of AIDS symptoms, reduce hospitalization, and reduce HIV/AIDS-related mortality (Fitriawan, et al., 2019). Optimal adherence to ARV therapy remains a major challenge worldwide (Zahra, et al., 2024). According to WHO data (2025), In 2024, 31.6 million or 77% of HIV survivor were receiving antiretroviral therapy but only 73% have successfully controlled their viral load, which is far below the WHO of 95%. Patient compliance is very necessary for ARV treatment. In Indonesia, the percentage of PLWHIV patients who compliance with HIV/AIDS treatment is still extremely low, ranging from 40% to 70%; this percentage is still below the 95% national target (Latif, et al., 2014). Compliance with the ARV treatment above 95% is required for HIV-infected patients to achieve complete viral suppression (Abadiga, et al., 2020). Indonesia has a key strategy for HIV prevention and control by achieving triple 95s by 2030.

The Triple 95s refer to the goals that 95% of PLWHIV are aware of their status, 95% of PLWHIV are receiving ARV treatment, and 95% of those on ARV achieve viral suppression (Afriana, et al., 2023). In 2022, data from the Ministry of Health show that only 51% of PLWHIV who on ARV therapy, 54% of PLWHIV are at a loss for follow-up status, 6% discontinued ARV, and 40% died. This shows that Indonesia is still unable to reach the target. Noncompliance with ARV treatment leads the virus to advance, leading to an increase in viral load, a drop in T lymphocyte count, the manifestation of AIDS symptoms, and cross-resistance to other ARV (Fitriawan et al., 2019).

The success and effectiveness of ARV therapy is determined by PLWHIV adherence to the therapy (Sari, et al., 2021). Compliance is a complex matter and is influenced by many factors ARV (Fitriawan, et al., 2019). Therapy adherence indicates that the patient understands

the importance of treatment and follows the instructions (Hayatiningsih, et al., 2017). Noncompliance with ARV may result in a rise of viral resistance, leading in higher viral replication and development of opportunistic infections and other diseases (Soares, et al., 2019). Low adherence to ARV therapy leads to an increase in annual HIV mortality (Ministry of health of the Republic of Indonesia, 2021). One things that affects therapy compliance is knowledge. A basic understanding of the disease condition allows patients to make decisions about whether to adhere to therapy (Hardianti, et al., 2023). Identifying aspects associated with medication adherence is crucial in finding patients at risk of noncompliance and developing interventions to improve adherence, which is influenced by a variety of factors (Fitriawan, et al., 2019). The aim of this study is to investigate in the relationship between knowledge level and ARV therapy adherence between PLWHIV in Surakarta.

2. RESEARCH METHOD

This study used a cross-sectional design and was carried out at the VCT polyclinic in the Department of Internal Medicine at the aforementioned Surakarta hospital. Patients who were diagnosed with HIV between April and July of 2024 were included in the study population. A purposive sampling strategy with tight inclusion and exclusion criteria was used for selecting a sample of 60 patients from these populations. Participants were to be between 18 and 65 years old, actively receiving ARV therpy, and have complete medical records. Conversely, patients with a history of neurodegenerative disease or those taking medications other than ARVs were excluded.

The independent varibale was the level of knowledge regarding HIV and ARV therapy, measured with a statement-based questionnaire. The dependent variable was patient adherence scale (MMAS-8), where “Yes” responses were scored as 0 and “No” as 1. All collected data were subsequently analyzed using SPSS software. To investigate the relationship among the two variables, a bivariate analysis was performed using the Spearman Rank statistical test, a method supported by Priantoro (2018). The results were considered statistically significant if the p-value < 0.05. The study was approved by the Dr. Moewardi General Hospital's Health Research Ethics Committee before it started (Number: 679/III/HREC/2024).

3. RESULTS AND DISCUSSION

Table 1. Description of Characteristics HIV Patients.

Characteristic	**n**	**%**
Age		
Teenagers	4	6.7%
Early adulthood	25	41.7%
Late adulthood	31	51.7%
Total	60	100.0%
Education		
Elementary school	9	15.0%
Junior high school	9	15.0%
Senior high school	29	48.3%
College	31	21.7%
Total	60	100.0%

According to Table 1, the HIV prevalence is highest in late adulthood (51.7%), followed by early adulthood (41.7%), and lowest among teenagers (6.7%). The educational level of most HIV patients is high school (48.3%), then tertiary education (21.7%), and the rest have elementary and middle school education, respectively (15.0%).

Table 2. Overview of Patient Knowledge about HIV.

Independent Variable	n	%
Knowledge		
Poor level of knowledge	14	23.3%
Intermediate level of knowledge	10	16.7%
High level of knowledge	36	60.0%

According to the table 2 above, more than half patients had a level of knowledge in the high category of 60.0%; the level of knowledge in the poor category was 23.3%; and the remainder had a level of knowledge in the Intermediate category of 16.7%.

Table 3. The Level of Adherence to ARV Therapy in HIV Patients (MMAS-8).

Dependent variable	n	%
Compliance (MMAS-8 score)		
Low (score <6)	21	35%
Moderate (score 6-7)	10	16.7%
High (score 8)	29	48.3%

As can be seen from the table 3, the majority of patients (48.3%) have a high degree of compliance, followed by 16.7% in the medium group and 35.0% in the low category.

Table 4. Relationship Between Knowledge and Adherence to ARV therapy HIV patients.

Knowledge	Adherence						Total		r	*p-value*
	Low		Moderate		High					
	n	%	n	%	n	%	n	%		
Low	13	92.9%	0	0.0%	1	7.1%	14	100%	0.572	<0.001
Moderate	1	10.0%	6	60.0%	3	30.0%	10	100%		
High	7	19.4%	4	11.1%	25	69.4%	36	100 %		
Total	21	35.0%	10	16.7%	29	48.3%	60	100.%		

Table 4 shows that of the 21 patients with poor level knowledge, the majority of them have low compliance (92.9%). Patient with intermediate level of knowledge is mostly with moderate compliance (60.0%). While patient with high level of knowledge had high compliance (69.4%). As a result, higher levels of knowledge correlate with better levels of adherence to ARV therapy. According to the correlation test results, r=0.572 and *p* 0.001 ($p < 0.05$) suggest that knowledge and adherence to antiretroviral medication are positively and significantly correlated in PLWHIV. The strength of the association is in the middle range (r=0.400 to 0.599).

DISCUSSION

Analysis of Respondent Characteristics

The study results showed that 51.7% of respondents were aged 36–45 years. This is consistent with research conducted by Rahmawati et al. (2023). This age group is reported to have the highest yearly rate of HIV infections. The study by Amelia et al., (2016), respondents who are classified as adults had a 3,937 times increased risk of suffering from HIV than those in the early adulthood age category. The highest level of education respondents was in senior high school (48.3%). Followed by levels higher education (21.7%), and the rest had elementary school education (15.0%) and junior high school (15.0%). This is in consistent with previous study shows that the education level of PLWHIV is the highest at the secondary education level (62.7%). Education can influence someone to take action and choose the right attitude, which is one of the influencing factors in perceptions, supports treatment-seeking behaviour, and improves quality of life, as well as increasing the need for HIV basics and improving treatment efforts (Wulandari & Rukmi, 2021). Other studies have found that individuals with a secondary or lower level of education have lower ART adherence in recent months compared to individuals with a college or university degree (Izzah, et al., 2024).

Level of Knowledge of HIV Patients

According to Table 2, patients with high level of knowledge by 60.0%, then the poor level of knowledge 23.3%, and the level of category knowledge is moderate by 16.7%. There is high correlation between level of knowledge and HIV because higher knowledge levels result in better prevention attitudes, and conversely (Ismail, et al., 2022) Education and counseling can improve the knowledge of PLWHIV ($p = 0.03$) to help understand the disease, ARV treatment, adherence to therapy, potency side effects, and duration of treatment (Wulandari & Rukmi, 2021). PLWHIV's knowledge about HIV and ARV can influence therapy adherence. This is due to knowledge-based behaviour is more lasting than non-knowledge-based behaviour (Supriyatni et al., 2023).

According to cross-sectional research of 99 HIV/AIDS-positive women, 57.58% of participants had lack of ART adherence. Studying regression Double logistics indicate that ARV adherence is significantly related to knowledge of ART adverse effects, depression, peer support, and ARV availability (p 0.05). Knowledge is the most important factor influencing ART adherence, with an OR of 64.02 (95% CI 4.99-670.12) (Surilena & Valeria, 2015). Counselling activities for PLWHIV patients is one method of increasing knowledge (Lestari et al., 2018).

The Level of Adherence to ARV Therapy in HIV Patients

Table 3 shows the level of compliance in the high category at 48.3%, then the low category compliance level at 35.0%, and the moderate category compliance level at 16.7%. In accordance with the results of Srikartika's research (2019), 51.6% of the respondents were highly compliant with ARV therapy and the lowest compliance was 19.4%.

Aspects that can support adherence to ARV therapy include social/family support, understanding of HIV and its treatment, and internal characteristics within PLWHIV (Srikartika, et al., 2019). Strong familial and social support was found to be associated with greater medication adherence among PLWHIV compared to those with weaker support (Abadiga, et al., 2020). This outcome is consistent with research conducted in Eastern Ethiopia, Ghana, and Sub-Saharan Africa (Abadiga et al., 2020). Several studies suggest that social support predicts treatment adherence (Fitriawan et al., 2019). Low social support is a common issue for those living with HIV. Low social support is related to society's stigma and discrimination toward PLWHIV (Vyavaharkar, et al., 2010). In previous research, there were 35% who had a low compliance category, this can be caused by low levels of knowledge, fear of societal stigma, depression, distrust of medication, forgetting to take medication, and fear of drug side effects (Sugiharti et al., 2014). Antiretroviral adherence was affected by side effects of the therapy ($p < 0.001$). Participants most frequently reported nausea and dizziness as antiretroviral side effects, however some also experienced weakness, diarrhea, and trouble focusing (Arisudhana, et al., 2019). According to other studies, factors that significantly influence non-adherence to ARV treatment include smoking, a sedentary lifestyle, a lack of exercise understanding among partners and relatives about the patient's serological status, loss of treatment (Soares, et al., 2019). In addition, common reasons for noncompliance include fatigue, work-related issues, financial difficulties, and depression (Zahra, et al., 2024).

The Relationship Between Level of Knowledge and Adherence to ARV therapy in HIV Patients.

According to the findings of this study, 21 patients with poor level of knowledge had low compliance (92.9%), followed by patients with intermediate level of knowledge with moderate compliance (60.0%) and patients with high level of knowledge with high compliance (69.4%). The results of the correlation test obtained a value of r = 0.572 and a value of p 0.001 ($p<0.05$), which means that there is a positive and significant relationship between knowledge and adherence to antiretroviral therapy in HIV patient. This study supports the findings of Putra et

al. (2021), who found an association between PLWHIV's understanding of HIV/AIDS and their adherence to ARV therapy at the Dinoyo Health Center in Malang City. This study uses Chi Square analysis with a significance value of 0.019 (p <0.05). Knowledge about ARV can affect the adherence of PLWHIV to therapy. This is because knowledge-based behavior can lead to long-term adherence during antiretroviral therapy (Putra et al., 2021). Understanding the disease and treatment regimen is essential for adherence to ARV. Patient medication knowledge includes the drug name, purpose, dosage schedule, side effects, and special instructions. Knowledge about medications has a significant impact on how people utilize them, especially in patients with chronic illnesses (Shrestha et al., 2023). Effective ARV treatment can increase life expectancy, reduce HIV drug resistance, slow progression, and reduce the risk of transmission to others (Rifqian & Mediana, 2024). According to Martiana et al. (2019), knowledge about ARV and adherence to it are positively correlated. (p = 0.010; α = 0.05). Additionally, the results of the regression analysis indicate that knowledge about ART has a significant effect on adherence to ARV theraphy (OR = 2.817) (Martiana et al., 2019).

Prior studies suggests that knowledge is the main factor that leads to adherence to ART because knowledge enhances self-motivation and attitudes towards adherence to treatment (Surilena & Valeria, 2015). Good knowledge makes it easier for someone to conduct healthily. Underlying behaviour good knowledge can result in long-term, obedient behaviour throughout ARV treatment (Supriyatni et al., 2023). Knowledge of HIV/AIDS and ARV therapy had an important effect on ARV adherence (p = 0.01), according to research by Lailiah et al (2021). Good knowledge of HIV disease, effective ARV usage, and information on side effects and drug reactions will each have an impact on improving ARV adherence.

This understanding can be strengthened through education or peer support groups to learn about the disease and treatment, especially for recently diagnosed PLWHIV (Lailiah, et al., 2021). Based on a recent study by Waskito et al. (2023), there is a correlation between PLWHIV's knowledge and adherence to ARV therapy (p = 0.002 and OR = 4.9). Respondents with significant knowledge were 4.9 times more likely to adhere to ARV therapy than those with little understanding. Knowledge is the outcome of perception of something. Knowledge and cognition have a significant impact on human conduct. Compared to non-knowledge-based behavior, knowledge-based behavior is longer lasting (Waskito et al., 2020).

Another study found that understanding ARV therapy lines and future treatment options is a major predictor of ARV therapy adherence. Of the 402 patients assessed, 101 were aware of the sort of ARV theraphy they were getting and that their future treatment options were limited. Patients who are aware will be more compliant than those who are unaware of ARV treatment and future treatment choices (Ramadhani et al., 2016).

Education about ARV treatment options and the limitations of future pharmaceutical availability for PLHIV is deemed critical. Education about ARV treatment options and the limitations of future pharmaceutical availability for PLHIV is deemed critical. That knowledge is expected to increase patient adherence to ARV therapy and influence individual behavior. This understanding is likely to change the behavior of PLWHIV and increase their adherence to ARV (Ramadhani et al., 2016). Cross-sectional research of 34 individuals using Fisher's exact and chi-square tests revealed a strong correlation between education, HIV/AIDS knowledge, and ARV medication adherence. The majority of responders were men aged 20 to 25, had a secondary education, and practiced high ARV adherence (Rifqian & Mediana, 2024).

A correlational analytical study contradicted the findings of this study. Among 67 PLWHIV, there was no apparent relationship between knowledge and adherence to ARV therapy (r=0.113; p=0.153). The study discovered that numerous factors influence adherence to ARV therapy, including individual awareness and motivation, stressful schedules (particularly for those who currently work), intolerance to drug side effects, and laziness in taking medication after the course is finished (Wulandari & Rukmi, 2021). The Spearman correlation test indicates no significant link between adherence to ART treatment, side effects,

and knowledge level (p = 0.959; p = 0.719). However, adherence to ART therapy was found to be strongly associated to family support (p = 0.004). PLWHIV can better adhere to ARV treatment if they have a thorough understanding of HIV/AIDS. However, adherence is influenced by more than just the level of knowledge (Wulandari & Rukmi, 2021). Adherence to ARV therapy is also influenced by family support; PLWHIV with supportive families can improve adherence by 53.7% (p = 0.034) (Debby et al., 2019). The adverse effects of ARV theraphy are also a contributing factor to PLWHIV non-adherence to their treatment. PLWHIV consider this to be disruptive to their comfort during activities (Debby et al., 2019). The adverse effects of ARVs are also a contributing factor to PLHIV's non-adherence to their treatment. PLWHIV consider this to be disruptive to their comfort during activities (Latif et al., 2014).

4. CONCLUSION

This study concludes that a significant relationship between knowledge level and adherence to ARV therapy among HIV patients in the VCT polyclinic of Dr. Moewardi Hospital in Surakarta, with a medium strength grade. To increase adherence, comprehensive HIV/AIDS education or counselling programs are strongly needed, particularly among PLWHIV with poor levels of knowledge and understanding other factors like self-motivation, ARV side effects, and support for PLWHIV also require consideration.

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