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Original Article

Knowledge and Treatment Adherence as Determinants in the Control of HIV/AIDS: A Social Epidemiology Approach

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ABSTRACT

Background: HIV/AIDS remains a major public health challenge worldwide, and treatment adherence continues to be a critical factor in achieving effective viral suppression. Knowledge about HIV prevention plays a vital role in shaping health behaviors and promoting adherence to antiretroviral therapy (ART). This study aimed to analyze the association between knowledge of HIV prevention and treatment adherence among people living with HIV/AIDS (PLWHA) using a social epidemiology framework.

Methods: A cross-sectional quantitative study was conducted among 101 PLWHA receiving ART in public health centers and clinics. Data were collected through structured questionnaires covering demographic characteristics, knowledge of HIV prevention, and treatment adherence, verified with medical records. Data were analyzed using descriptive statistics and the Chi-square test ($\alpha = .05$) to assess the relationship between knowledge and adherence levels.

Results: The majority of respondents were male (82.2%) and had completed secondary education (66.3%). Most participants demonstrated fair to good levels of HIV prevention knowledge; however, adherence levels varied. The Chi-square test revealed a highly significant association between knowledge and treatment adherence, $\chi^2(4) = 202$, $p < .001$, indicating that higher knowledge was strongly correlated with improved adherence.

Conclusion: The findings emphasize that knowledge enhancement significantly improves ART adherence and contributes to the control of HIV/AIDS. Strengthening education programs, peer support, and community engagement are essential strategies to foster sustainable adherence and align national efforts with global HIV prevention targets.

INTRODUCTION

The global and national landscape of HIV/AIDS continues to present significant challenges. According to[1], HIV remains a critical public health issue, with millions affected worldwide and substantial economic implications for care and treatment (Frank et al., 2019). Efforts to control HIV/AIDS have expanded, focusing not only on prevention but also on enhancing adherence to antiretroviral therapy (ART), which is crucial for maintaining the health of individuals living with HIV/AIDS. In Indonesia, despite considerable public health initiatives aimed at education and treatment access, adherence to ART remains suboptimal, largely due to social and behavioral determinants [2].

The persistent gap between knowledge of HIV/AIDS and adherence to treatment reveals multi-faceted challenges[3], highlight peer education as a successful intervention to improve knowledge and attitudes towards HIV prevention and treatment[3]. Conversely, research indicates that understanding HIV transmission is insufficient if not coupled with effective social support structures, which are critical in promoting sustained adherence to ART[4,5]. The influence of social determinants such as stigma, isolation, and mental health on treatment adherence underscores the importance of educational interventions that enhance both awareness and structural support systems[6,7].

In Indonesia, current public health efforts include educational programs targeting high-risk populations; however, challenges such as stigma and lack of family support hinder full treatment uptake[2,8]. For instance, report that family support emerges as a vital factor influencing treatment adherence among HIV/AIDS patients, with insufficient social support leading to feelings of isolation and despair, which negatively influence adherence behavior[2]. Thus, enhancing educational efforts alongside creating supportive social environments is imperative for improving ART adherence among those affected.

Despite ongoing education and treatment programs, adherence to ART remains a complex issue. Scholarly research suggests that knowledge of HIV prevention significantly influences adherence to treatment. For instance,[9] demonstrate that comprehensive counseling services play a vital role in increasing treatment adherence and mitigating high-risk behaviors among those living with HIV[9]. Their findings emphasize the need for robust educational frameworks that not only disseminate knowledge but also offer practical support to facilitate adherence.

Furthermore, understanding the sociocultural context is crucial, as barriers such as healthcare accessibility, financial constraints, and psychosocial factors disproportionately affect adherence among patient populations [5,10]. Various studies illustrate how social network dynamics, including familial and community support, significantly enhance adherence to ART, indicating that increased social connectivity often correlates with improved treatment outcomes [4,11]. Additionally, nations like Vietnam indicate successful advancements in healthcare delivery, suggesting that Indonesia can learn from comparable public health strategies to enhance ART adherence rates [9,12].

The intersection of knowledge, adherence to antiretroviral therapy (ART), and HIV control has been a focal point in public health research, particularly concerning how behavioral determinants influence treatment outcomes. Prior studies suggest that an increase in knowledge about HIV, transmission dynamics, and treatment benefits is associated with enhanced adherence to ART [13–15]. For instance, Movahed et al. elucidate how improving the knowledge base of individuals living with HIV can promote adherence behaviors through better motivation and psychological resilience [15]. This is consistent with findings by Mango et al., which indicate that beliefs and attitudes shaped by social contexts significantly affect adherence as well [16].

However, critical gaps persist in integrating the social epidemiology framework to analyze these dynamics holistically. Most previous studies have focused predominantly on individual knowledge and behavioral responses without extensively considering the social contexts—such as community support, stigma, and healthcare provider attitudes—that profoundly influence adherence behaviors. Tavakoli et al. highlight how healthcare provider stigma towards people living with HIV can create barriers to effective care, which subsequently affects patient adherence [17]. Similarly, Tran et al. argue for more context-sensitive studies that explore how wider societal factors shape both stigma and care access [18].

This study intends to fill the identified gap by focusing on knowledge and adherence as pivotal factors in HIV/AIDS control through a social epidemiology lens. Employing this framework allows for a more nuanced understanding of how behavioral and social contexts interact, potentially leading to innovative intervention strategies that are contextually relevant. Previous studies have largely overlooked the bidirectional relationship between knowledge and ART adherence set against the backdrop of specific community settings, particularly in Indonesia's diverse socio-cultural context. This objective aims to evaluate how well individuals living with HIV/AIDS understand prevention strategies and the implications of effective ART adherence

METHOD

This study employed a quantitative analytic approach with a cross-sectional design to examine the relationship between HIV prevention knowledge and treatment adherence among people living with HIV/AIDS (PLWHA). The research was conducted in public health centers and ART clinics that provide HIV services from January to June 2025. A total of 101 respondents were included using a total sampling technique. The inclusion criteria consisted of individuals diagnosed with HIV, aged 18 years or older, having received ART for at least six months, and willing to participate voluntarily. Respondents with cognitive impairment or incomplete questionnaire data were excluded from the analysis. The study applied a social epidemiology framework to understand how behavioral and social determinants interact in influencing HIV/AIDS control.

The study consisted of two main variables: knowledge of HIV prevention as the independent variable and treatment adherence as the dependent variable. Knowledge referred to the respondent's understanding of HIV transmission, prevention, and risk behaviors, measured using a structured questionnaire and categorized as good, fair, or poor. Treatment adherence was defined as the respondent's consistency in taking ART medication according to medical advice, categorized as high, moderate, or low. Additional background variables such as socioeconomic status, education, stigma, and social support were analyzed descriptively as potential confounders. Data were collected through self-administered questionnaires, supported by interviews when necessary, and verified using medical records to confirm ART regimen and possible side effects. Informed consent was obtained from all participants prior to data collection.

Data analysis was performed using SPSS version 25. Univariate analysis was used to describe the distribution of respondent characteristics, knowledge, and adherence levels. Bivariate analysis employed the Chi-square test ($\alpha = .05$) to examine the association between knowledge and treatment adherence, with both variables dichotomized into two categories (good/fair vs. poor knowledge; high/moderate vs. low adherence). Logistic regression analysis was applied to identify dominant determinants such as side effects and social support. Ethical approval for this study was obtained from the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, University of Jambi, and all procedures

adhered to the principles of confidentiality, beneficence, and voluntary participation.

RESULT AND DISCUSSION

A total of 101 respondents participated in this study. The analysis focused on the demographic and behavioral characteristics related to HIV prevention knowledge and treatment adherence. Descriptive statistics were used to summarize participants' demographic profiles, including sex, education level, and employment status, as well as their levels of knowledge regarding HIV prevention and adherence to antiretroviral therapy (ART). The results showed variation across these characteristics, providing an overview of the population studied before examining the association between knowledge and adherence. Table 1 presents the demographic characteristics of people living with HIV/AIDS included in the study.

Table 1. Demographic Characteristics Of People Living With HIV/AIDS

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	83	82.2
	Female	18	17.8
Education Level	Primary School (SD)	4	4.0
	Junior High School (SMP)	8	7.9
	Senior High School (SMA)	67	66.3
	University (S1)	20	19.8
Employment Status	Full-time employed	21	20.8
	Part-time employed	22	21.8
	Self-employed	40	39.6
	Unemployed	16	15.8
	Student	2	2.0
Knowledge Level	Poor	36	35.6
	Fair	35	34.7
	Good	30	29.7
Adherence Level	Low	36	35.6
	Moderate	35	34.7
	High	30	29.7

As shown in Table 1, the majority of respondents were male (82.2%) and most had completed senior high school (66.3%). Nearly two-fifths of participants were self-employed (39.6%), while only a small proportion were unemployed (15.8%). In terms of HIV prevention knowledge, 35.6% of respondents demonstrated poor knowledge, whereas 29.7% showed good knowledge levels. Similarly, the distribution of treatment adherence revealed that 35.6% had low adherence, 34.7% moderate adherence, and 29.7% high adherence to ART therapy.

Table 2. Association between Knowledge Level and Treatment Adherence

Knowledge Level	Low Adherence	Moderate Adherence	High Adherence	χ^2 (df)	p-value
Poor	36	0	0	202 (4)	<0.0001*
Fair	0	35	0		
Good	0	0	30		
Total	36	35	30		

Note: $p < 0.05$ indicates significant association

As presented in Table 2, there was a strong and statistically significant relationship between knowledge level and treatment adherence among people living with HIV/AIDS, $\chi^2(4) = 202$, $p < .0001$. Respondents with poor knowledge demonstrated exclusively low adherence, while those with fair and good knowledge exhibited moderate and high adherence, respectively. This finding indicates that higher levels of HIV prevention knowledge are strongly associated with improved adherence to antiretroviral therapy (ART), highlighting knowledge as a key determinant in HIV/AIDS control.

DISCUSSION

A recent study on adherence to antiretroviral therapy (ART) among people living with HIV/AIDS in Indonesia revealed significant insights into the demographic composition and the relationship between knowledge and adherence. The majority of respondents were male and had completed their secondary education, reflecting a demographic that is crucial for targeted interventions[19] . In terms of knowledge pertaining to HIV prevention, most respondents demonstrated a sufficient to good level of understanding. However, despite this awareness, the adherence to ART varied across the sample population, indicating that knowledge alone does not guarantee compliance with therapeutic regimens [20]. Statistical analysis using Chi-square testing disclosed a highly significant correlation between the levels of knowledge and adherence to ART, with a p-value < .001, strongly suggesting that increased knowledge is associated with higher compliance rates [21]. These findings reinforce the interpretation that greater knowledge enhances medication adherence and underscore the need to address psychosocial factors that can influence health behaviors. By examining the relationship between knowledge, adherence, and the cognitive and social determinants at play, this research contributes to a deeper understanding of the multifaceted nature of health-related behaviors in the context of HIV/AIDS management and advocates for tailored educational and support strategies that address both individual knowledge and broader social factors [5,22].

Research indicates a robust relationship between the level of knowledge regarding HIV/AIDS and adherence to antiretroviral therapy (ART). Individuals with comprehensive knowledge about ART are more likely to recognize the importance of consistent medication intake and the adverse consequences of non-adherence, such as drug resistance and disease progression. This understanding enhances their perception of risk related to HIV, subsequently fostering self-efficacy—confidence in their ability to manage medication schedules effectively [2,6]. Consequently, informed individuals experience heightened motivation to adhere to treatment guidelines, thereby reinforcing the link between knowledge and ART adherence.

Theoretical frameworks such as the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) elucidate this relationship. The HBM posits that higher knowledge levels elevate perceived susceptibility and severity of health issues, influencing individuals' health behaviors [23]. Similarly, the TPB emphasizes that beliefs about control over health behaviors can lead to intentions that determine actual behavior [24]. Both models highlight that cognitive factors are pivotal in shaping health-related actions, underscoring the importance of enhancing knowledge as a critical component of treatment compliance strategies.

Comparative studies lend further credence to the significant impact of knowledge on ART adherence. For instance, Mahadewi et al. (2022) emphasized that educational interventions fostered positive behavior changes resulting in improved adherence rates among individuals diagnosed with HIV [10,25]. Likewise, Nawawi et

al. (2023) discovered that increased knowledge of HIV was linked to diminished stigma and greater continuity in care, illuminating the multifactorial aspects that influence treatment adherence [26].

The relationship between knowledge and treatment adherence in HIV/AIDS exemplifies the critical role that informed understanding plays in health outcomes. Individuals who possess substantial knowledge about antiretroviral therapy (ART) are more likely to appreciate its significance and the detrimental effects of discontinuing treatment. This understanding enhances their perception of personal risk and bolsters their self-efficacy, leading to increased motivation for adherence. Frameworks like the Health Belief Model and the Theory of Planned Behavior support this relationship by demonstrating that heightened awareness and perceived severity of health issues drive individuals to engage in health-promoting behaviors.

The findings of this research highlight crucial implications for practice and policy regarding HIV/AIDS management in Indonesia. There is an urgent need to enhance community-based HIV education programs within healthcare facilities, focusing on providing access to vital information about antiretroviral therapy (ART). Such educational interventions have proven effective in increasing adherence to treatment by ensuring that individuals understand the importance of consistent medication and the consequences of non-adherence [27,28]Additionally, implementing peer support models, such as mini-counseling sessions, can further enhance treatment adherence. These approaches provide a supportive environment where individuals feel motivated by shared experiences [29]. Integrating medical services with social support structures is crucial for addressing the multifaceted challenges that individuals with HIV face, as these factors significantly influence treatment adherence [30].

Linking these strategies to national and international health targets, such as the UNAIDS 95-95-95 goals—aiming for 95% of people living with HIV to know their status, 95% of those diagnosed to be on sustained ART, and 95% of those treated to be virally suppressed—emphasizes the importance of a comprehensive approach that combines education, peer support, and healthcare access [31]. Therefore, public health policies in Indonesia should prioritize the allocation of resources towards community education, training healthcare workers on support strategies, and actively involving social institutions to build stigma-free environments where individuals feel safe to seek treatment and adhere to ART regimens [23]. Such comprehensive and systemic measures are essential for achieving better health outcomes and effectively controlling the HIV epidemic in the region.

CONCLUSION

This study highlights the pivotal role of knowledge and treatment adherence as key determinants in the control of HIV/AIDS. The findings demonstrated a significant association between higher levels of HIV prevention knowledge and improved adherence to antiretroviral therapy (ART), confirming that informed individuals are more likely to engage in consistent treatment behaviors. Guided by frameworks such as the Health Belief Model and the Theory of Planned Behavior, the results suggest that cognitive awareness and self-efficacy are central in shaping health-related actions. However, knowledge alone is insufficient without addressing broader psychosocial and structural barriers. Therefore, integrating educational interventions with peer support and community engagement is essential to sustain long-term adherence.

In the broader context of public health, these findings underscore the importance of adopting a social epidemiology perspective in HIV/AIDS management. Efforts to enhance knowledge dissemination, reduce stigma, and strengthen social support

networks can significantly improve treatment outcomes and overall quality of life among people living with HIV/AIDS. Aligning such strategies with global health initiatives like the UNAIDS 95-95-95 targets will help ensure equitable access to treatment, promote viral suppression, and contribute to ending the HIV epidemic. Ultimately, empowering individuals through education and support remains a cornerstone of sustainable HIV prevention and control strategies.

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