Research Articles **Open Access**

Antiretroviral Therapy Adherence as a Relational Process: The Roles of U=U Awareness, Discrimination, and Viral Suppression among People Living with HIV in Steady Partnerships in Indonesia

Dwi Kartika Rukmi[1]*, Rizqi Wahyu Hidayati[2], Kharisma Kharisma[3], Fika Lilik Indrawati[4]
[1]Universitas Jenderal Achmad Yani, Yogyakarta, Indonesia
[2]Universitas Jenderal Achmad Yani, Yogyakarta, Indonesia
[3]Universitas Jenderal Achmad Yani, Yogyakarta, Indonesia
[4]Universitas Respati Yogyakarta, Yogyakarta, Indonesia

*Corresponding Author: E-mail: kartikarukmi@gmail.com

ARTICLE INFO	ABSTRACT
  KEYWORDS 	**Introduction:** Adherence to antiretroviral therapy (ART) is a central determinant of treatment success among people living with HIV (PLWH). However, how relational and psychosocial factors operate within steady partnerships to shape adherence remains insufficiently understood in the Indonesian context. This study aimed to examine key predictors of ART adherence among PLWH in steady partnerships, focusing on individual, relational, and therapy-related factors in Yogyakarta, Indonesia. **Methods:** A cross-sectional survey was conducted among 370 PLWH with steady partners across five districts in Yogyakarta between April and July 2025 using a self-administered questionnaire. Descriptive statistics, bivariate analyses, and binary logistic regression were applied to identify factors independently associated with ART adherence. **Results:** Overall, 78.4% of respondents demonstrated good ART adherence. In the adjusted logistic regression model, understanding the Undetectable = Untransmittable (U=U) concept (AOR = 2.26; 95% CI: 1.02–4.98; p = 0.043), absence of HIV-related discrimination (AOR = 0.46; 95% CI: 0.26–0.82; p = 0.008), and having an undetectable viral load (AOR = 2.64; 95% CI: 1.61–4.32; p < 0.001) emerged as the strongest independent predictors of adherence. Other relational variables, including partner support and ART duration, were associated with adherence in bivariate analyses but did not remain significant after adjustment. **Conclusions:** These findings indicate that ART adherence among PLWH in steady partnerships is primarily shaped by treatment-related knowledge, stigma-free social environments, and virological outcomes. HIV care programs should prioritize U=U–based education, stigma reduction strategies, and routine viral load monitoring to sustain adherence. Relational and partner-based approaches may hold programmatic relevance but warrant further investigation through longitudinal or intervention-based studies to clarify their independent contribution to ART adherence in Indonesia.

INTRODUCTION

Antiretroviral therapy (ART) has been a milestone in HIV management, transforming what was once a fatal infection into a chronic, manageable condition (1,2). The success of this transformation depends heavily on lifelong adherence, as inconsistent use of ART can lead to virologic failure, drug resistance, and ongoing transmission (3). At the population level, sustained ART adherence remains a central determinant of treatment effectiveness and epidemic control.

In Indonesia, ART services, including free medications, laboratory tests, and trained healthcare staff, are available nationwide (4). Despite these advances, ART adherence remains suboptimal. By mid-2024, only around 62% of people living with HIV (PLWH) were receiving ART, and fewer than half achieved viral suppression (5). This gap between service availability and treatment outcomes indicates that improving adherence cannot be achieved through biomedical provision alone.

Beyond structural and biomedical advances, behavioral determinants remain critical in shaping adherence. ART adherence is not merely a clinical requirement but a sustained behavioral process influenced by cognitive appraisal, emotional regulation, and social context. Several studies across Indonesia, including Bandung, Situbondo, Ketapang, and Yogyakarta, have reported moderate to high levels of adherence among PLWH (6–9). However, most of these studies have been grounded in an individualistic framework, emphasizing personal knowledge, stigma perception, or medication side effects. While informative, such approaches provide limited insight into how adherence is sustained within everyday relational environments, particularly among individuals who share their lives with intimate partners. Sustained ART adherence requires not only personal motivation but also social regulation, emotional reinforcement, and shared routines that support consistent medication-taking behavior (10). From a relational perspective, adherence is rarely an isolated act; rather, it is embedded in interactions that may reinforce or undermine treatment engagement. Yet, empirical research in Indonesia has largely overlooked these interpersonal dynamics, focusing instead on individual-level determinants. This omission may reflect broader sociocultural sensitivities surrounding HIV disclosure, marital privacy, and the moralization of illness, which have historically constrained partner-based inquiry and intervention.

International evidence increasingly highlights the importance of relational factors in ART adherence. Evidence from other health behavior studies in Indonesia further demonstrates that social capital, particularly family and peer support, strengthens intention formation and sustained behavior change by reinforcing subjective norms and perceived control within culturally cohesive communities (11). A global meta-analysis demonstrated that social support and self-efficacy significantly improve adherence outcomes (12). Similarly, research in Southeast Asia showed that PLWH in stable, supportive relationships were more likely to maintain high adherence levels compared to those without partner involvement (13). Importantly, partner support appears to operate through specific behavioral pathways, such as shared illness appraisal, normalization of medication routines, and mutual regulation of health behaviors, rather than functioning as a passive protective factor.

At the same time, the treatment-as-prevention (TasP) framework provides an important biomedical–behavioral linkage, emphasizing that consistent adherence leading to viral suppression not only improves individual health outcomes but also eliminates the risk of sexual HIV transmission (14,15). Within this framework, concepts such as Undetectable = Untransmittable (U=U) may act as cognitive–motivational mechanisms, strengthening adherence by reframing ART from a burdensome obligation into a means of protecting both oneself and one's partner. Conversely, experiences of HIV-related discrimination may disrupt adherence by undermining self-worth, increasing concealment behaviors, and weakening engagement with care, even within intimate relationships.

For PLWH who are married or in steady partnerships, relational qualities such as intimacy, openness, and emotional reciprocity have been associated with improved treatment continuity (10). However, theoretical models suggest that these relational factors do not automatically translate into adherence, but exert their influence through mediating processes such as shared illness understanding, mutual responsibility, and perceived safety within the relationship (16). Without explicitly examining these mechanisms, the role of partnership dynamics risks being overstated or misunderstood.

Despite growing international literature, empirical evidence integrating relational, psychosocial, and therapy-related determinants of ART adherence within a coherent theoretical framework remains limited in Indonesia. Existing studies have rarely examined how individual knowledge (e.g., U=U), social experiences (e.g.,

discrimination), and biomedical outcomes (e.g., viral suppression) interact within steady partnerships to shape adherence behavior (17,18). This gap is particularly relevant in the Indonesian sociocultural context, where family norms, marital roles, and collective responsibility may uniquely influence health behavior.

Therefore, this study seeks to address this gap by examining ART adherence among PLWH in steady partnerships through an integrative lens, combining individual, relational, and therapy-related factors. By situating adherence within relational and treatment-as-prevention frameworks, this study aims to identify key predictors of adherence while clarifying the conceptual pathways through which knowledge, stigma, and virological outcomes shape sustained treatment engagement in Yogyakarta, Indonesia.

METHOD

Design and setting

This study employed a quantitative analytic cross-sectional design to identify key predictors of ART adherence among people living with HIV (PLWH) who have steady partners in five districts of the Yogyakarta Region, Indonesia. By December 2024, the total number of PLWH residing in Yogyakarta was 8,627 individuals. Using a 95% confidence interval and a 5% margin of error via an online sample size calculator, the minimum required sample size was 368. To ensure adequate statistical power, 370 participants were included in the analysis.

Participants were recruited using purposive sampling, which enabled the inclusion of PLWH who met specific relational and clinical criteria relevant to the study objectives. This approach was selected due to ethical, logistical, and contextual considerations inherent in HIV research, including limited public registries, confidentiality concerns, and stigma-related barriers that restrict the feasibility of probability-based sampling. Purposive sampling has been widely applied in HIV adherence studies to access hard-to-reach populations while maintaining ethical safeguards and data validity.

Eligible participants were aged 18 years or older, married or in a steady partnership, had cohabited with their partner for at least six months, and provided voluntary consent. Individuals who had lived separately from their partner for more than one month during the study period or who were in the AIDS stage were excluded to minimize clinical instability that could confound adherence behavior.

Variables, data collection, and analysis

The dependent variable was ART adherence, measured using a single item: "In the past 30 days, how many days did you not take your HIV medication as directed?" (19). Based on the standard 95% adherence threshold frequently referenced for achieving viral suppression (20), respondents missing more than two doses were categorized as non-adherent, while those missing no more than one or two doses were categorized as adherent. Although ART adherence is a multidimensional construct, prior studies have demonstrated that single-item measures provide acceptable validity in large-scale behavioral and clinical HIV research. Nevertheless, the use of a single-item measure may limit the assessment of adherence complexity and is acknowledged as a methodological limitation.

Independent variables were grouped into individual, spousal, and therapy-related domains. Individual factors included age, gender, religion, district location, education, occupation, HIV education experience (yes/no), understanding of the Undetectable = Untransmittable (U=U) concept (yes/no), and experience of HIV-related discrimination (yes/no).

Spousal factors included the partner's HIV status (unknown, positive, negative) and perceived relational support, operationalized as the frequency of mutual openness, emotional support, and joint problem-solving related to HIV care (never to always). These relational items were adapted from commonly used social support and dyadic interaction constructs in HIV adherence research. Internal consistency analysis demonstrated acceptable reliability for the relational scale (Cronbach's α = 0,81). Where full psychometric validation was not feasible, results were interpreted cautiously.

Therapy-related factors included type of ART regimen (TLE/TLD/other), duration of ART use (<3 years or ≥3 years), and most recent viral load status (unknown, detected, undetectable).

Data were collected using a structured self-administered questionnaire distributed during routine monthly ART clinic visits. Participants received a standardized explanation of the study and provided written informed consent prior to participation. Research assistants were available to clarify questionnaire items as needed. Completed

questionnaires were checked for completeness, and participants received a modest transportation allowance of IDR 50,000.

Statistical analyses were conducted using SPSS version 25. Descriptive statistics were used for univariate analysis. Given the ordinal nature of several variables and the non-normal distribution confirmed by the Kolmogorov–Smirnov test, bivariate associations were examined using Kendall's Tau or Spearman's rho correlation tests, as appropriate. Variables with p-values <0.25 in bivariate analysis were included in the multivariate logistic regression model. This threshold was selected in accordance with established recommendations for logistic regression modeling to avoid the premature exclusion of potentially important predictors (21).

Ethical considerations

This research received ethical approval from the Ethics Committee of Jenderal Achmad Yani University Yogyakarta, Indonesia (Approval No: Skep/098/KEPK/VIII/2025). The study was conducted in compliance with research ethics for human subjects, including obtaining informed consent, ensuring respect for participants' dignity, maintaining non-discrimination, and destroying personal data within six months after analysis to prevent misuse.

RESULTS

The study included 370 people living with HIV (PLWH) who have steady partners across five districts of Yogyakarta. The majority were male (51.1%) with a mean age of 39.2 years (SD = 8.6), Muslim (86.2%), and resided predominantly in Sleman District (37.8%). Most had completed senior high school (59.7%) and worked in the informal sector (56.2%). Nearly all participants had received HIV education (98.4%) and understood the Undetectable = Untransmittable (U=U) concept (89.5%). In addition, 70.5% reported never experiencing HIV-related discrimination (Table 1).

Overall, the sample reflects a relatively mature and treatment-experienced population with high exposure to HIV information, providing an appropriate basis for examining adherence-related determinants within stable partnerships.

Individual Characteristics

Table 1. Individual characteristics of PLWH with steady partners (n = 370)

Characteristics	Category	n	%	Mean ± SD
Age (years)				39.2 ± 8.6
Religion	Islam	319	86.2	
	Christian	31	8.4	
	Catholic	20	5.4	
District	City	93	25.1	
	Sleman	140	37.8	
	Bantul	78	21.1	
	Gunung Kidul	36	9.7	
	Kulon Progo	23	6.2	
Gender	Male	189	51.1	
	Female	181	48.9	
Education	Elementary	20	5.4	
	Junior High	56	15.1	
	Senior High	221	59.7	
	University	73	19.7	
Occupation	Civil Servant	19	5.1	
	Private Employee	143	38.6	

Characteristics	Category	n	%	Mean ± SD
	Informal Sector	208	56.2	
Received HIV Education	Yes	364	98.4	
	No	6	1.6	
Understood U=U Concept	Yes	331	89.5	
	No	39	10.5	
Experienced HIV-related Discrimination	No	261	70.5	
	Yes	109	29.5	

More than half of respondents (54.9%) reported having HIV-negative partners, while 29.2% had partners who were also living with HIV. The majority described moderate to high levels of mutual openness and problem-solving support within their relationships, with 55.4% reporting such interactions often or always (Table 2).

These spousal characteristics highlight the presence of relational contexts that may facilitate shared responsibility, emotional regulation, and mutual monitoring of health behaviours, all of which are theoretically relevant to ART adherence.

Spousal Characteristics

Table 2. Spousal characteristics of PLWH (n = 370)

Characteristics	Category	n	%
Partner's HIV Status	Unknown	59	15.9
	Positive	108	29.2
	Negative	203	54.9
Openness and Support	Never	82	22.2
	Rarely	38	10.3
	Sometimes	45	12.2
	Often	109	29.5
	Always	96	25.9

Regarding therapy-related characteristics, 78.4% of participants were classified as adherent to ART. Most respondents were using the TLD regimen (83.2%), had been on ART for more than three years (85.1%), and had achieved an undetectable viral load (83.0%) (Table 3).

The predominance of long-term ART use and viral suppression suggests that adherence in this population is shaped not only by treatment access, but also by sustained behavioural and psychosocial factors.

ART-Related Characteristics

Table 3. ART-related characteristics of PLWH (n = 370)

Characteristics	Category	n	%
ART Adherence	Adherent	290	78.4
	Non-adherent	80	21.6
ART Type	TLD	308	83.2
	TLE	62	16.8
Viral Load Status	Undetected	307	83.0
	Detected	40	10.8
	Unknown	23	6.2

Characteristics	Category	n	%
Duration of ART Use	>3 years	315	85.1
	<3 years	55	14.9

Bivariate Analysis

Bivariate analyses were conducted to examine associations between individual, spousal, and therapy-related variables and ART adherence. The selection of statistical tests was guided by the level of measurement and distributional characteristics of each variable. Continuous variables that were not normally distributed (e.g., age) were analysed using Spearman's rank correlation, while ordinal and categorical variables were examined using Kendall's Tau correlation to account for non-parametric data structures. This approach ensured methodological consistency and appropriate estimation of association strength across heterogeneous variable types.

Bivariate analysis identified six variables significantly associated with ART adherence: receipt of HIV education, understanding of the U=U concept, experience of HIV-related discrimination, partner's HIV status, viral load status, and duration of ART use ($p < 0.05$) (Table 4).

In accordance with standard epidemiological modelling practices, variables demonstrating an association with ART adherence at a threshold of $p < 0.25$ in bivariate analysis were considered eligible for inclusion in the multivariate logistic regression model.

These findings suggest that adherence is influenced by an interaction of cognitive factors (knowledge and treatment understanding), psychosocial experiences (discrimination), relational context (partner serostatus), and biomedical indicators (viral load and treatment duration).

To avoid excluding variables with potential theoretical relevance, factors meeting the predefined inclusion threshold were subsequently entered into the multivariate model.

Table 4. Bivariate correlations between individual, spousal, and therapy characteristics and ART adherence (n = 370)

Characteristics	Test	r	p-value
Age (years)	Spearman	-0.092	0.079
Religion	Kendall Tau	0.019	0.711
District	Kendall Tau	-0.066	0.165
Gender	Kendall Tau	0.054	0.297
Education	Kendall Tau	-0.002	0.970
Occupation	Kendall Tau	-0.031	0.547
Received HIV education	Kendall Tau	0.140	0.007*
Understood U=U concept	Kendall Tau	0.205	<0.001*
Experienced HIV-related discrimination	Kendall Tau	-0.136	0.009*
Partner's HIV status	Kendall Tau	0.196	<0.001*
Openness & Support	Kendall Tau	0.068	0.149
ART Type	Kendall Tau	0.077	0.137
Viral Load Status	Kendall Tau	0.363	<0.001*
ART Duration	Kendall Tau	0.205	<0.001*

*Significant at $p < 0.05$

Multivariate Analysis

Variables with a p-value < 0.25 in bivariate analysis were entered into the multivariate logistic regression model to identify independent predictors of ART adherence. Reference categories were determined a priori based on clinical relevance and interpretability. For categorical variables, the reference groups were as follows: lack of understanding of the U=U concept, experience of HIV-related discrimination, detectable viral load, non-TLD ART

regimen, ART duration of less than three years, and having an HIV-positive partner. These categories represent conditions theoretically associated with higher adherence risk or treatment vulnerability.

The final multivariate analysis identified three independent predictors of ART adherence: understanding the U=U concept (AOR = 2.26, 95% CI: 1.02–4.98, p = 0.043), absence of HIV-related discrimination (AOR = 0.46, 95% CI: 0.26–0.82, p = 0.008), and having an undetectable viral load (AOR = 2.64, 95% CI: 1.61–4.32, p < 0.001) (Table 5).

These results indicate that PLWH who understood the preventive implications of viral suppression, experienced fewer discriminatory encounters, and achieved virologic control were significantly more likely to maintain ART adherence, even after adjusting for demographic, relational, and therapy-related variables.

Table 5. Logistic regression analysis of factors associated with ART adherence (n = 370)

Variable	B	p-value	AOR (Exp B)	95% CI for AOR
Age	-0.030	0.069	0.97	0.94 – 1.00
District	-0.064	0.605	0.94	0.74 – 1.19
HIV Education	-0.111	0.919	0.90	0.10 – 7.65
Understood U=U concept	0.815	**0.043***	**2.26**	**1.02 – 4.98**
No HIV-related discrimination	-0.781	**0.008***	**0.46**	**0.26 – 0.82**
Partner's HIV Status	0.160	0.423	1.17	0.79 – 1.73
Openness & Support	0.091	0.340	1.09	0.91 – 1.32
ART Type	0.303	0.473	1.35	0.59 – 3.09
Viral Load Status (Undetectable)	**0.970**	**<0.001***	**2.64**	**1.61 – 4.32**
ART Duration	0.447	0.230	1.56	0.75 – 3.24

*Significant at p < 0.05

Overall, understanding the U=U concept, absence of HIV-related discrimination, and undetectable viral load emerged as the strongest predictors of ART adherence among PLWH in steady partnerships in Yogyakarta. The findings underscore the interconnected roles of knowledge, psychosocial safety, and biomedical feedback in sustaining adherence, suggesting that adherence is not solely an individual behaviour but a product of relational and structural conditions surrounding treatment.

DISCUSSION

This study found that people living with HIV (PLWH) who understood the concept of "Undetectable = Untransmittable" (U=U) were significantly associated with higher ART adherence, with those reporting U=U understanding showing more than twofold greater odds of adherence (AOR = 2.26; 95% CI: 1.02–4.98; p = 0.043). The U=U concept has been widely promoted as a public-health strategy to transform perceptions of HIV, foster empowerment, and reduce stigma by reframing HIV as a manageable chronic condition rather than a moral or social failure (22). The principle emphasizes that maintaining an undetectable viral load through consistent ART use effectively eliminates the risk of sexual HIV transmission (22). Within this context, U=U understanding may function as a cognitive and motivational anchor that aligns treatment adherence with personal and relational goals, rather than as a direct causal determinant.

Our findings are broadly consistent with, but not entirely identical to, global evidence suggesting that comprehension and acceptance of the U=U message are associated with stronger engagement in ART care. A qualitative study in Rwanda reported that PLWH who internalized U=U messaging and had longer ART experience expressed greater commitment to continued treatment and clinic attendance. In the present study, high proportions of adherence (78.4%), U=U understanding (89.5%), and viral suppression (83.0%) were observed. However, this convergence may also reflect a relatively treatment-experienced sample, potentially limiting variability and attenuating the observable strength of associations compared with settings where ART access and health literacy are more uneven. While these findings align with the meta-analysis by Tuot et al. highlighting treatment knowledge as a

key adherence correlate(13), they should be interpreted as associative rather than explanatory, given the cross-sectional design.

HIV-related stigma and discrimination remain persistent challenges in Indonesia and continue to shape engagement in HIV care (23–25) . In this study, absence of discriminatory experiences was independently associated with better adherence, underscoring the salience of psychosocial safety in sustaining long-term treatment engagement. Discriminatory encounters, ranging from social avoidance to denial of care, have been consistently linked to disengagement from services and poorer virologic outcomes (26). In the Indonesian socio-cultural context, where HIV is often entangled with moral judgement and fear of social exclusion, discrimination may exert both direct psychological stress and indirect effects through concealment behaviors that complicate adherence routines. The U=U movement has sought to counter these dynamics by reducing fear-based stigma and promoting dignity-centered care (27). Nevertheless, the persistence of discrimination in this sample suggests that biomedical messaging alone may be insufficient without parallel structural and cultural interventions.

Relational and spousal factors showed significant associations with adherence at the bivariate level but did not retain statistical significance in multivariate analysis. This divergence from some prior studies warrants critical reflection rather than dismissal. Previous research in Malawi and Indonesia has demonstrated that partner support, intimacy, and shared problem-solving are linked to adherence behaviors (10). In the present study, although many participants reported frequent openness and mutual support, these relational variables may have been confounded by stronger biomedical and cognitive factors, particularly viral suppression status and U=U understanding, thereby diminishing their independent statistical contribution in the adjusted model.

Another plausible explanation lies in measurement sensitivity: the relational construct was assessed using a limited number of items, which may not have fully captured the complexity of partner dynamics, power relations, or disclosure negotiations within Indonesian HIV-affected relationships. Additionally, cultural norms emphasizing harmony and conflict avoidance may lead respondents to over-report relational support, introducing social desirability bias and reducing discriminatory power.

Viral suppression demonstrated the strongest association with adherence, with PLWH who had undetectable viral load showing substantially higher odds of adherence (AOR = 2.64; 95% CI: 1.61–4.32; p < 0.001). Rather than implying causality, this finding reflects a reciprocal relationship, whereby consistent adherence contributes to viral suppression, while awareness of suppressed viral load may reinforce motivation to maintain treatment. Prior studies have similarly reported close correlations between adherence, CD4 count, and viral load (28). UNAIDS estimates that viral suppression can be achieved within six months of consistent ART use, substantially reducing transmission risk when viral load remains below 200 copies/mL (29). Adherence and viral suppression thus reinforce each other: consistent medication use maintains health and reduces transmission risk, while achieving viral suppression strengthens motivation for ongoing adherence (30).

From a nursing and public-health perspective, these findings highlight the need for integrated approaches that extend beyond medication provision. Value-based and dignity-centered nursing models rooted in compassion, trust, and community responsibility, such as those articulated in Islamic-informed nursing frameworks, offer an ethical foundation for stigma-sensitive HIV care and sustained treatment engagement (31). While relational factors did not emerge as independent predictors in multivariate analysis, they remain contextually important as potential mediators or moderators of cognitive and biomedical influences (31). Holistic, nurse-led interventions that combine U=U education, stigma-reduction strategies, and culturally sensitive partner engagement may therefore offer greater sustainability than single-component adherence programs. Previous studies have shown that psychosocially integrated HIV care improves retention and quality of life (32). Similarly, holistic nursing approaches emphasize the interconnectedness of physical, psychological, and relational dimensions in chronic disease management, including HIV care (33). These insights reaffirm the nursing role in empowering PLWH through empathy-based education, partner-involved counseling, and culturally sensitive stigma reduction.

This study has several limitations. Its cross-sectional design precludes causal inference, and adherence was measured using a single self-reported item, which may be subject to recall and social desirability bias. These limitations may partly explain the attenuation of relational effects in multivariate analysis. Future research should employ longitudinal designs, mixed-methods approaches, or validated multi-item adherence and relational scales to more precisely examine causal pathways and mediating mechanisms within Indonesian HIV-affected partnerships.

In summary, ART adherence among PLWH in steady relationships in Yogyakarta was associated with understanding of the U=U concept, absence of HIV-related discrimination, and viral suppression status. The findings suggest that adherence is shaped by a dynamic interplay of cognitive, psychosocial, relational, and biomedical factors rather than by isolated determinants. Strengthening nurse-led education, stigma-sensitive care, and contextually grounded partner engagement remains essential for sustaining ART adherence and enhancing the dignity and well-being of PLWH within Indonesia's socio-cultural landscape.

CONCLUSION

This study concludes that three primary factors significantly influence antiretroviral therapy (ART) adherence among people living with HIV (PLWH) in steady partnerships in Yogyakarta, Indonesia: understanding the U=U concept, absence of HIV-related discrimination, and undetectable viral load status. PLWH who comprehend and internalize the U=U message are more motivated to maintain treatment consistency, while freedom from discrimination enhances psychological well-being and treatment engagement. Viral suppression not only reflects successful clinical outcomes but also reinforces motivation and a sense of self-agency in managing HIV.

These findings highlight that ART adherence is not solely a biomedical issue but a social and relational process that requires a holistic approach. Health professionals, especially nurses and health educators, should integrate U=U-based education, partner involvement, and stigma reduction into adherence counseling and HIV care programs. Strengthening family and partner support systems within Indonesia's sociocultural context can further sustain adherence motivation and promote long-term health outcomes.

Future research should employ longitudinal or interventional designs to evaluate the effectiveness of partner-based and stigma-reduction strategies in sustaining adherence. Interprofessional collaboration among nurses, counselors, and community health workers will be essential to implementing holistic HIV care that upholds both clinical and psychosocial well-being.

AUTHOR'S CONTRIBUTION STATEMENT

Rukmi DK conceptualized the study design, conducted data analysis, and prepared the initial manuscript draft. Hidayati RW and Indrawati FL contributed to data collection, data verification, and manuscript review. Kharisma K assisted in statistical analysis and interpretation. All authors critically reviewed, revised, and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest that could influence the objectivity or integrity of this research.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During manuscript preparation, the authors only used language support tools for grammar and formatting checks. All analyses, interpretations, and conclusions were determined independently by the authors.

BIBLIOGRAPHY

1. Klatt NR, Chomont N, Douek DC, Deeks SG. Immune activation and HIV persistence: implications for curative approaches to HIV infection. Immunol Rev. 2013;254:326–42. https://doi.org/10.1111/imr.12065.
2. World Health Organization. HIV. [Internet]. 2022. Available from: https://www.who.int/news-room/fact-sheets/detail/hiv-aids
3. Rooks-Peck CR, Wichser ME, Adegbite AH, DeLuca JB, Barham T, Ross LW. Analysis of Systematic Reviews of Medication Adherence Interventions for Persons with HIV, 1996–2017. AIDS Patient Care STDS. 2019;33(528):37. https://doi.org/10.1089/apc.2019.0125.
4. Jocelyn NFM, Nasution N, Asshiddiqi M, Kimura N, Siburian M. HIV/AIDS in Indonesia: current treatment landscape, future therapeutic horizons, and herbal approaches. Front Public Heal. 2024;12:1–11. https://doi.org/10.3389/fpubh.2024.1298297.
5. Kemenkes RI. Laporan Eksekutif Perkembangan HIV AIDS Dan Penyakit Infeksi Menular Seksual (PIMS) Semester I Tahun. Vol. 1. 2024. https://hivaids-pimsindonesia.or.id/download?kategori=Laporan%20Triwulan
6. Maulida A, Yuswar MA, Purwanti NU. Gambaran Tingkat Kepatuhan Berobat Antiretroviral Pada Pasien HIV/AIDS. J Syifa Sci Clin Res. 2023;4:590–9. https://doi.org/10.37311/jsscr.v4i3.15444.
7. Puspasari D, Wisaksana R, Ruslami R. Gambaran Efek Samping dan Kepatuhan Terapi Antiretroviral pada Pasien HIV di Rumah Sakit Dr. Hasan Sadikin Bandung Tahun 2015. JSK. 2018;3:175–81. https://doi.org/10.24198/jsk.v3i4.18495
8. Ardiana A, Endrian Kurniawan D, Purwandari R, Kurniawati Y. Gambaran Pengetahuan tentang HIV AIDS dan Kepatuhan Terapi ARV pada Pasien ODHA di Rumah Sakit Situbondo. J Nurs Care. 2024;10:97–110. https://doi.org/10.52365/JNC.v10i2.1151.
9. Wulandari EA, Rukmi DK. Hubungan Tingkat Pengetahuan dengan Kepatuhan Terapi ARV pada ODHA di Yogyakarta. J Keperawatan Klin Dan Komunitas. 2022;5(157). https://doi.org/10.22146/jkkk.49663.
10. Wardhani SF, Yona S. Spousal intimacy, type of antiretroviral drug, and antiretroviral therapy adherence among hiv patients in Bandung, Indonesia. J Public Heal Res. 2021;10:17–21. DOI: 10.4081/jphr.2021.2336.
11. Riyadi S, Marmi M, Madury S Al, Farid M. Smoking Cessation Behavior Among Madurese Adolescents: The Role of Social Capital and the Theory of Planned Behavior. Media Publ Promosi Kesehat Indones. 2025;8(9):971–80. https://doi.org/10.56338/mppki.v8i9.7883
12. Shubber Z, Mills EJ, Nachega JB, Vreeman R, Freitas M, Bock P, et al. Patient-Reported Barriers to Adherence to Antiretroviral Therapy: A Systematic Review and Meta-Analysis. PLoS Med. 2016;13(11):e1002183. https://doi.org/10.1371/journal.pmed.1002183.
13. Tuot S, Sim JW, Nagashima-Hayashi M, Chhoun P, Teo AKJ, Prem K, et al. What are the determinants of antiretroviral therapy adherence among stable people living with HIV? A cross-sectional study in Cambodia. AIDS Res Ther [Internet]. 2023;20:47. https://doi.org/10.1186/s12981-023-00544-w
14. Tattersall T, Tam C, Moore D, Wesseling T, Grieve S, Wang L, et al. Healthcare and treatment experiences among people diagnosed with HIV before and after a province-wide treatment as prevention initiative in British Columbia, Canada. BMC Public Health. 2022;22(1022). https://doi.org/10.1186/s12889-022-134152
15. Msosa TC, Kabaghe A, Twabi HH, Mpinganjira S, Mzumara W, Boer MS-D, et al. Prevalence and Determinants of Viral Suppression in Young People Living with HIV on Antiretroviral Therapy in Southern Africa: A Cross-Sectional Analysis of HIV Survey Data of 2020 and 2021. AIDS Behav. 2025;29:1962–1972. https://doi.org/10.1007/s10461-025-04662-6
16. Yona S, Edison C, Nursasi AY, Ismail R. Self-awareness as the key to successful adherence to antiretroviral therapy among people living with HIV in Indonesia: A grounded theory study. Belitung Nurs J. 2023;9:176–83. https://doi.org/10.33546/bnj.2480.
17. Hutahaean BSH, Stutterheim SE, Jonas KJ. Barriers and Facilitators to HIV Treatment Adherence in Indonesia: Perspectives of People Living with HIV and HIV Service Providers. Trop Med Infect Dis. 2023;8(3):138. https://doi.org/10.3390/tropicalmed8030138

18. Johnson MO, Dilworth SE, Taylor JM, Darbes LA, Comfort ML, Neilands TB. Primary Relationships, HIV Treatment Adherence, and Virologic Control. AIDS Behav. 2012;16(6):1511–1521. https://doi.org/10.1007/s10461-011-0021-0

19. Hou J, Fu R, Jiang T, Yu NX. Delineating the dyadic coping process in HIV serodiscordant male couples: a dyadic daily diary study using the common fate model. Qual Life Res. 2025. https://doi.org/10.1007/s11136-025-03903-4.

20. Zahra AN, Waluyo A, Yona S. Concept Analysis Of Adherence To Antiretroviral Therapy In People Living With HIV/Aids. J Aisyah J Ilmu Kesehat. 2024;9:513–25. https://doi.org/10.30604/jika.v9i1.2555

21. Dahlan MS. Statistik untuk Kedokteran dan Kesehatan Deskriptif, Bivariat dan Multivariat Dilengkapi Aplikasi dengan Menggunakan SPSS. Jakarta: Salemba Medika.; 2014.

22. ViiV Healthcare. What is U=U (Undetectable = Untransmittable)? Exploring the Power of Undetectable = Untransmittable (U=U) for HIV [Internet]. Vol. 1, ViiV Healthcare. 2024. Available from: https://viivhealthcare.com/about-hiv/living-with-hiv/u-equals-u/

23. Riono P, Challacombe S. HIV in Indonesia and in neighbouring countries and its social impact. Oral Dis. 2020;26(Suppl 1):28–33. https://doi.org/10.1111/odi.13560

24. Fauk NK, Hawke K, Mwanri L, Ward PR. Stigma and discrimination towards people living with hiv in the context of families, communities, and healthcare settings: A qualitative study in Indonesia. Int J Env Res Public Heal. 2021;18. https://doi.org/10.3390/ijerph18105424.

25. Fauk NK, Ward PR, Hawke K, Mwanri L. HIV Stigma and Discrimination: Perspectives and Personal Experiences of Healthcare Providers in Yogyakarta and Belu, Indonesia. Front Med. 2021;8:1–11. https://doi.org/10.3389/fmed.2021.625787.

26. Januraga PP, Reekie J, Mulyani T, Lestari BW, Iskandar S, Wisaksana R. The cascade of HIV care among key populations in Indonesia: a prospective cohort study. Lancet HIV. 2018;5:e560. https://doi.org/10.1016/S2352-3018(18)30148-6.

27. Zuniga JM. U = U: A Catalyst for Ending AIDS as a Public Health Threat. J Int Assoc Provid AIDS Care. 2024;23:1–3. https://doi.org/10.1177/23259582241282561

28. Nursalam N, Sukartini T, Misutarno M, Priyantini D. Adherence to antiretroviral therapy, CD4 count, viral load, and opportunistic infections in people with HIV/AIDS: a cross-sectional study. J Ners. 2024;19:88–94. https://doi.org/10.20473/jn.v19i1.49958.

29. UNAIDS. Undetectable = untransmittable — Public health and HIV viral load suppression 2024:8 [Internet]. Geneva, Switzerland: UNAIDS; 2024. Available from: https://www.unaids.org/sites/default/files/media_asset/undetectable-untransmittable_en.pdf

30. Okoboi S, Mujugira A, Nekesa N, Castelnuovo B, Lippman SA, King R. Barriers and facilitators of adherence to long-term antiretroviral treatment in Kampala, Uganda. PLOS Glob Public Heal. 2025;5. https://doi.org/10.1371/journal.pgph.0004121.

31. Marmi M, Riyadi S. Islamic principles in nursing leadership: Lesson learned from Rufaida Al-Aslami's lens and legacy. J Holist Nurs Sci. 2025;12(1):326–32. https://doi.org/10.31603/jhns.v12i2.13718

32. Leblanc NM, Muheriwa-Matemba SR, Vil N St., Alcena-Stiner D, Bond KT, Glazier A, et al. Couple-centered HIV prevention and care: Endorsement, practice and uncertainty among us healthcare providers in western-central upstate New York. PLoS One. 2025;20(2):e0299185. https://doi.org/10.1371/journal.pone.0299185

33. Ambushe SA, Awoke N, Demissie BW, Tekalign T. Holistic nursing care practice and associated factors among nurses in public hospitals of Wolaita zone, South Ethiopia. BMC Nurs. 2023;22(1):390. https://doi.org/10.1186/s12912-023-01517-0