

Efektivitas Terapi Antiretroviral pada Orang yang Hidup dengan HIV: Tinjauan Literatur Naratif mengenai Luaran Klinis, Kepatuhan, dan Determinan Psikososial

Effectiveness of Antiretroviral Therapy in People Living with HIV: A Narrative Literature Review of Clinical Outcomes, Adherence, and Psychosocial Determinants

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Abstrak

Terapi antiretroviral (*Antiretroviral Therapy/ART*) merupakan strategi utama dalam pengendalian infeksi HIV karena mampu menekan replikasi virus, meningkatkan status imun, serta menurunkan morbiditas dan mortalitas pada orang yang hidup dengan HIV (ODHIV). Namun, keberhasilan terapi tidak hanya ditentukan oleh efektivitas farmakologis, tetapi juga dipengaruhi oleh kepatuhan pengobatan, faktor psikososial, dan dukungan sistem pelayanan kesehatan. Penelitian ini bertujuan untuk menganalisis efektivitas terapi antiretroviral pada ODHIV melalui sintesis bukti ilmiah mengenai luaran klinis, kepatuhan terapi, determinan psikososial, dan efektivitas berbagai regimen ART. Penelitian ini menggunakan metode *narrative literature review* terhadap 30 artikel yang diperoleh dari basis data *Scopus*, *PubMed*, dan *Google Scholar*, dengan desain penelitian yang beragam, meliputi *cross-sectional*, kohort, retrospektif, prospektif, *systematic review*, *meta-analysis*, dan longitudinal. Sintesis data dilakukan secara tematik berdasarkan luaran klinis, kepatuhan terapi, determinan psikososial, dan efektivitas regimen ART. Hasil kajian menunjukkan bahwa ART secara konsisten mampu mencapai supresi viral load dan meningkatkan jumlah sel CD4 sebagai indikator keberhasilan virologis dan imunologis. Regimen berbasis dolutegravir (DTG) menunjukkan efektivitas virologis yang lebih baik dibandingkan regimen ART konvensional. Kepatuhan terapi dipengaruhi secara positif oleh pengetahuan pasien, edukasi, dukungan tenaga kesehatan, *pharmaceutical care*, dan intervensi berbasis *mHealth*, sedangkan depresi dan stigma terkait HIV berhubungan dengan rendahnya kepatuhan. Secara keseluruhan, ART efektif dalam meningkatkan luaran klinis pada ODHIV, sedangkan keberhasilan terapi jangka panjang juga dipengaruhi oleh kepatuhan dan faktor psikososial. Temuan ini mendukung pentingnya optimalisasi regimen ART dan dukungan berkelanjutan untuk mempertahankan keberhasilan terapi. Temuan ini juga menunjukkan bahwa keberhasilan pengobatan perlu dipertahankan melalui pemantauan kepatuhan dan dukungan psikososial yang berkelanjutan secara optimal.

Kata kunci: terapi antiretroviral¹; HIV/AIDS²; supresi viral load³; jumlah sel CD4⁴; kepatuhan terapi⁵;

Abstract

Antiretroviral Therapy (ART) is the primary strategy for controlling HIV infection because it suppresses viral replication, improves immune status, and reduces morbidity and mortality among people living with HIV (PLWH). However, treatment success is not determined solely by pharmacological efficacy but is also influenced by treatment adherence, psychosocial factors, and healthcare system support. This study aimed to analyze the effectiveness of antiretroviral therapy among PLWH by synthesizing scientific evidence on clinical outcomes, treatment adherence, psychosocial determinants, and the effectiveness of different ART regimens. A narrative literature review was conducted on 30 articles retrieved from Scopus, PubMed, and Google Scholar, encompassing various study designs, including cross-sectional, cohort, retrospective, prospective, systematic review, meta-analysis, and longitudinal studies. Data were synthesized thematically based on clinical outcomes, treatment adherence, psychosocial determinants, and ART regimen effectiveness. The findings showed that ART consistently achieved viral load suppression and increased CD4 cell counts as indicators of virological and immunological success. Dolutegravir (DTG)-based regimens demonstrated better virological effectiveness than conventional

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ART regimens. Treatment adherence was positively influenced by patient knowledge, education, healthcare professional support, pharmaceutical care, and mHealth-based interventions, whereas depression and HIV-related stigma were associated with lower adherence. Overall, ART was effective in improving clinical outcomes among PLWH, while long-term treatment success was also influenced by adherence and psychosocial factors. These findings support the importance of optimizing ART regimens and providing continuous adherence and psychosocial support to sustain treatment effectiveness and maintain long-term viral suppression among PLWH.

Keywords: antiretroviral therapy 1; HIV/AIDS 2; viral load suppression 3; CD4 cell count 4; treatment adherence 5

1. INTRODUCTION

Human Immunodeficiency Virus (HIV) continues to pose a major challenge to global public health. Despite considerable advances in prevention and treatment, HIV remains a significant health burden, with millions of individuals worldwide still living with the infection, as reported by the Joint United Nations Programme on HIV/AIDS (UNAIDS). The widespread use of antiretroviral therapy (ART) has fundamentally changed the clinical management of HIV by converting it from a fatal disease into a long-term manageable condition. ART effectively suppresses viral replication, improves immune system function, decreases the incidence of opportunistic infections, and enhances the overall quality of life of people living with HIV (PLWH) [1]. In view of these benefits, the World Health Organization (WHO) recommends that all individuals diagnosed with HIV begin ART as soon as possible after diagnosis, irrespective of their CD4 cell count, to achieve optimal health outcomes and minimize the risk of HIV transmission [2].

Despite the proven efficacy of ART in suppressing HIV replication and improving CD4 cell recovery, successful treatment extends beyond the pharmacological effects of the medication. Long-term virological control is strongly influenced by factors such as consistent medication adherence, uninterrupted engagement in healthcare services, and early initiation of therapy. Furthermore, growing evidence suggests that ART regimens containing integrase strand transfer inhibitors (INSTIs), particularly dolutegravir (DTG), provide better virological outcomes than earlier treatment options. These findings have contributed to the widespread adoption of DTG-based regimens as the preferred first-line treatment in many national and international HIV treatment guidelines [3].

Beyond clinical considerations, psychosocial factors are recognized as important determinants of successful ART. Psychological conditions such as depression, along with HIV-related stigma, discrimination, limited social support, and restricted access to healthcare services, have been consistently linked to poor medication adherence and unfavorable treatment outcomes. An umbrella review conducted by Necho et al. found that individuals experiencing depression were significantly more likely to exhibit non-adherence to ART, which in turn reduced the likelihood of achieving sustained viral suppression and adequate immune restoration [4]. In contrast, interventions including patient education, individualized counseling, pharmacist-led services, and mobile health (mHealth) technologies have been shown to enhance adherence and contribute to improved long-term treatment outcomes among people living with HIV [5],[6]

Although numerous studies have investigated the effectiveness of ART, the existing evidence is still dispersed across different areas of research. Most published studies have examined clinical outcomes, medication adherence, or psychosocial factors separately rather than considering their combined influence on treatment effectiveness. As a result, comprehensive evidence that integrates these interrelated aspects into a holistic understanding of ART outcomes remains scarce. A synthesis of the current literature is therefore needed to provide a more comprehensive view of the factors contributing to successful HIV treatment and to inform evidence-based strategies for optimizing HIV care [2],[5]

The present study seeks to assess the effectiveness of ART in people living with HIV by conducting a narrative literature review of 30 scientific publications. This review examines multiple dimensions of ART effectiveness, including clinical outcomes such as viral load suppression and CD4 cell recovery, medication adherence, and psychosocial factors that may influence treatment success. By integrating evidence from the existing literature, this study aims to provide valuable insights for evidence-based clinical decision-making and to support the development of comprehensive strategies for improving HIV treatment outcomes

2. METHODS

Study Design

This study was conducted using a narrative literature review approach to examine and critically synthesize existing evidence on the effectiveness of ART among people living with HIV (PLWH). A narrative review was selected because it allows the integration of evidence derived from diverse research methodologies, offering a broader understanding of ART effectiveness by considering clinical outcomes, treatment adherence, and psychosocial influences that are difficult to combine through quantitative meta-analytic methods alone [2], [7].

Literature Search Strategy

A systematic search of the literature was performed using three electronic databases: Scopus, PubMed, and Google Scholar. Eligible publications were limited to studies published between 2015 and 2025. The search strategy incorporated both Medical Subject Headings (MeSH) and free-text keywords linked with the Boolean operators (AND and OR). Search terms included *antiretroviral therapy*, *ART effectiveness*, *people living with HIV*, *viral load suppression*, *CD4 recovery*, *treatment adherence*, *medication adherence*, *depression*, *HIV-related stigma*, *social support*, *pharmaceutical care*, *mHealth*, *dolutegravir*, *integrase strand transfer inhibitor*, and *long-acting antiretroviral therapy*. To maximize study identification, the reference lists of relevant publications were manually reviewed to locate additional eligible articles that were not retrieved during the electronic database search [8].

Eligibility Criteria

Studies were included if they satisfied the following requirements: (1) evaluated the effectiveness or implementation of ART among people living with HIV/AIDS; (2) reported either clinical outcomes, such as viral load suppression or CD4 cell recovery, or program-related outcomes including medication adherence, retention in care, patient satisfaction, or healthcare interventions; (3) applied quantitative, qualitative, mixed-methods, systematic review, or meta-analysis designs; and (4) were published in peer-reviewed journals in either English or Indonesian. Publications classified as editorials, conference abstracts, letters to the editor, case reports, duplicate studies, or articles that did not report relevant outcome measures were excluded from the review [9].

Data Extraction and Analysis

After the screening and eligibility assessment, 30 studies were selected for inclusion. Relevant information extracted from each article included publication details, study location, research methodology, participant characteristics, ART regimen, evaluated outcomes, and major findings. The extracted data were organized into evidence tables to facilitate comparison across studies, enabling identification of common patterns, methodological differences, and recurring themes within the literature [2], [4].

Narrative Synthesis

The selected studies were integrated using a thematic narrative synthesis rather than statistical pooling, allowing evidence from different methodological approaches to be interpreted collectively. The synthesis was structured into five major themes: (1) clinical outcomes, including viral load suppression, CD4 cell recovery, and overall treatment effectiveness; (2) treatment adherence, covering medication adherence, patient education, counseling, pharmacist-led interventions, and digital adherence support; (3) psychosocial determinants, including depression, HIV-related stigma, disclosure status, self-efficacy, and social support; (4) therapeutic approaches, encompassing dolutegravir-based regimens, treatment simplification, long-acting ART, and third-line therapies; and (5) health system factors, including healthcare accessibility, pharmaceutical services, medication safety, and policy implementation. Findings across the included studies were critically interpreted to evaluate the consistency of existing evidence, identify remaining knowledge gaps, and highlight implications for improving ART outcomes among people living with HIV [10], [11], [12].

3. Result

A total of 30 studies fulfilled the predefined eligibility criteria and were included in this narrative literature review. The selected studies represented various methodological approaches, including cross-sectional, cohort, retrospective, prospective cohort, longitudinal, pre-post intervention, pharmacoeconomic, systematic review, meta-analysis, literature review, and mini-review studies. The studies examined ART effectiveness, adherence, clinical outcomes, and psychosocial factors among people living with HIV (PLWH).

A summary of the main characteristics of the included studies is presented in Table 1.

Table 1. Characteristics of the 30 Studies Included in the Narrative Literature Review

No	Authors	Design	Sample	Variables	Conclusion
1	Ahmad et al	Cross-sectional	87	Knowledge, provider attitudes, ART adherence	Education and healthcare provider roles are crucial in improving adherence
2	Chairiyah dan Narulita	Pre-post test	74	Education, ART knowledge	Educational interventions are effective in enhancing understanding
3	Imba et al.	Cross-sectional	25	Knowledge, adherence	Knowledge influences ART adherence
4	Sari et al.	Kohort retrospektif	102	ART regimen, viral load	Regimen choice affects treatment success
5	Anggraeni dan Ardhiyanti	Literature review	-	Adherence, healthcare services	Health system support is essential
6	Indriputri dan Askar	Cross-sectional	221	Treatment duration, virological suppression	ART is effective long-term
7	Auliafendri et al.	Retrospektif	70	Drug interactions	Drug monitoring is necessary
8	Wardhani dan Lukas	Retrospektif	50	CD4, ART	ART improves immune status
9	Rodrigues et al.	Retrospective cohort	-	ART simplification, viral load	Simplification is safe and beneficial
10	Amir et al.	Narrative review	-	ART development	Innovation enhances outcomes
11	Izzah et al.	Cross-sectional	95	Adherence, viral load	Adherence is a key factor
12	Fahrani et al.	Cross-sectional	89	Treatment duration, viral load	Consistency in therapy is important
13	Febriani et al.	Retrospective	42	CD4, adherence	Socioeconomic factors are important
14	Vanessa et al.	Cross-sectional	1292	Viral load, adherence	Adherence strongly determines success
15	Sihombing et al.	Cross-sectional	811	Viral load, regimen	Multiple factors influence outcomes
16	Permatasari et al.	Pharmacoeconomic	24	Cost, effectiveness	Cost efficiency is important
17	Meiners et al.	Longitudinal	522	Adherence, viral load	High adherence is required
18	Jocelyn et al.	Mini review	-	Stigma, access	Social approach is needed
19	Damulak et al.	Systematic review	31	Adherence interventions	External support is beneficial
20	Meireles et al.	Cohort	-	ART regimen	Pemilihan regimen penting
21	Mehrabi et al.	Meta-analysis	9561	Pregnancy, MTCT	ART crucial in pregnancy
22	Konishi et al.	Prospective	42	Long-acting ART	Injectable therapy is promising
23	Tsega et al.	Meta-analysis	14	Third-line therapy	Effective in advanced cases
24	Fei et al.	Meta-analysis	-	Disclosure, adherence	Social support is important
25	Kitaw et al.	Meta-analysis	1768	Third-line therapy	Advanced therapy is effective
26	Manalel et al.	Retrospective	3552	Regimen, adherence	Flexible regimens help
27	Mangala et al.	Retrospective	-	DTG, CD4	DTG highly effective
28	Girón-Callejas et al.	Meta-analysis	22	DTG, viral load	DTG shows superiority
29	Anggriani et al.	Cohort	-	CD4, ART combination	Combination therapy is key
30	Zeleke et al.	Prospective cohort	627	Depression, adherence	Psychological factors influence outcomes

Clinical Effectiveness of Antiretroviral Therapy

Table 2. Summary of Clinical Outcomes of Antiretroviral Therapy

Summary of Clinical Outcomes of Antiretroviral Therapy	Number of Studies	Key Findings
Viral load suppression	12	Most studies reported viral suppression rates exceeding 80%, with several reporting rates above 90%
CD4 cell recovery	5	ART consistently increased CD4 cell counts following treatment initiation ⁴
ART regimen effectiveness	8	Dolutegravir (DTG)-based regimens demonstrated superior virological effectiveness compared with earlier regimens.

Overall, the reviewed studies demonstrated that ART was effective in achieving viral load suppression and improving immune function. DTG-based regimens showed favorable virological outcomes compared with conventional regimens.

Factors Associated with ART Adherence

Table 3. Factors Associated with Antiretroviral Therapy Adherence

Factor	Number of Studies	Association with Adherence
Patient knowledge	3	Positive
Patient education	2	Positive
Healthcare provider support	2	Positive
Pharmaceutical care	2	Positive
Health interventions	1	Positive

Patient knowledge, education, healthcare provider support, pharmaceutical care, and health interventions were positively associated with ART adherence. These findings highlight adherence as an important factor in achieving effective treatment outcomes.

Psychosocial Determinants of ART Effectiveness

Table 4. Psychosocial Determinants Influencing ART Effectiveness

Psychosocial Factor	Number of Studies	Impact on ART Effectiveness
Depression	2	Positive
HIV-related stigma	3	Positive
Social support	4	Positive
HIV status disclosure	1	Positive

Psychosocial factors, particularly depression, HIV-related stigma, and social support, were associated with ART effectiveness. Depression and stigma may negatively affect treatment adherence, whereas adequate social support may contribute to better treatment outcomes.

Effectiveness of Different Antiretroviral Therapy Regimens

Table 5. Comparative Effectiveness of Antiretroviral Therapy Regimens

ART Regimen	Number of Studies	Key Findings
TLD	2	More effective than TLE in achieving viral load suppression.
DTG-based regimen	4	Demonstrated the highest virological effectiveness and greater CD4 recovery.
Long-acting ART	1	Successfully maintained long-term viral suppression.
Third-line ART	2	Achieved viral suppression rates of approximately 80%.
TDF + 3TC + EFV	1	Effectively improved CD4 cell counts

Overall, DTG-based regimens demonstrated favorable virological effectiveness compared with conventional regimens. Long-acting and third-line ART also showed promising effectiveness in maintaining viral suppression in selected patients.

DISCUSSION

Clinical Effectiveness of Antiretroviral Therapy

The findings of the current review reinforce the central role of antiretroviral therapy (ART) in improving health outcomes among people living with HIV (PLWH). Most of the included studies demonstrated that ART effectively achieved viral load suppression and increased CD4 cell counts. These findings are consistent with previous research showing that sustained ART is associated with effective control of HIV replication and progressive immune recovery. Therefore, the findings of the current review are in agreement with previous evidence regarding the clinical effectiveness of ART. This evidence also supports the WHO recommendation for early initiation and uninterrupted continuation of ART to maintain viral suppression and reduce HIV-related morbidity and mortality [9].

The current review also found that dolutegravir (DTG)-based regimens produced more favorable virological outcomes than conventional efavirenz-based therapies. This finding is consistent with previous international studies reporting that DTG provides a higher genetic barrier to resistance, more rapid viral suppression, and better tolerability than earlier first-line ART regimens [12], [13]. Thus, the findings of the current study are aligned with previous research and support current international treatment guidelines recommending DTG-based therapy as a preferred first-line option because of its effectiveness and safety profile [14].

The current review further identified improvement in CD4 cell counts as an important indicator of ART effectiveness. This finding is consistent with previous research demonstrating that sustained viral suppression is associated with progressive immune reconstitution, particularly among individuals initiating ART before advanced immunodeficiency [35]. The findings therefore support previous evidence that viral load suppression and CD4 cell recovery provide complementary measures of treatment success [15], [16].

Although ART demonstrated strong pharmacological effectiveness in the current review, the findings also indicate that treatment efficacy alone does not guarantee optimal long-term outcomes. Consistent with previous studies, treatment adherence, regular clinical follow-up, and continuous access to antiretroviral drugs were identified as important factors influencing treatment success [5], [6], [17]. These findings are therefore in agreement with previous research and emphasize the importance of a patient-centered HIV care model that combines effective ART regimens with adherence support, routine monitoring, and continuous clinical management.

Factors Associated with ART Adherence

The current review identified treatment adherence as one of the most important factors influencing ART effectiveness. The findings showed that greater patient knowledge regarding HIV infection and ART was associated with better adherence. This finding is consistent with previous research demonstrating that patient education and adherence counseling improve understanding, treatment motivation, and medication-taking behavior among PLWH. Thus, the current findings align with previous evidence that education and healthcare professional support are important components of long-term ART adherence.

The current review also found that pharmaceutical care and digital health interventions contributed to improved ART adherence. These findings are consistent with previous studies showing that medication reminders, teleconsultation, and pharmacist-led interventions can strengthen treatment continuity and communication between patients and healthcare professionals [18], [19]. Therefore, the current findings are generally consistent with previous research, particularly regarding the potential role of digital health strategies in supporting adherence in settings where regular face-to-face follow-up may be challenging [4], [20], [2], [21].

Psychosocial Determinants of ART Effectiveness

The current review found that psychosocial factors, particularly depression, HIV-related stigma, and social support, were associated with ART treatment outcomes. These findings are consistent with previous research

indicating that depression and HIV-related stigma can reduce medication adherence, healthcare utilization, and retention in care. [22], [7], [8]. In contrast, adequate social support from family members, peers, and healthcare professionals was associated with better adherence and sustained engagement in HIV care. Overall, the findings of the current review are in agreement with previous research concerning the important influence of psychosocial conditions on ART effectiveness.

The current review also indicated that HIV status disclosure may facilitate access to emotional, informational, and practical support. This finding is consistent with previous research showing that appropriate disclosure can strengthen social support and contribute to better treatment engagement and adherence [10], [11]. Therefore, the current findings support previous evidence that psychosocial support and appropriate disclosure strategies can complement pharmacological treatment in improving long-term ART outcomes.

Effectiveness of Different Antiretroviral Therapy Regimens

The current review found that DTG-based regimens generally demonstrated better virological outcomes than conventional efavirenz-based therapies. This finding is consistent with previous research and current treatment recommendations that identify DTG as a preferred first-line treatment option. The current review also found that simplified ART regimens could maintain treatment effectiveness while providing favorable safety outcomes, particularly regarding renal and bone health [13], [23]. These findings are therefore aligned with previous evidence supporting regimen optimization without compromising therapeutic effectiveness.

The current review further found that long-acting injectable ART showed promising effectiveness among clinically stable individuals. This finding is consistent with previous research indicating that long-acting ART can reduce daily pill burden and maintain viral suppression in appropriately selected patients [24]. Similarly, the effectiveness of third-line ART identified in the current review is in agreement with previous evidence showing that advanced treatment options can provide favorable outcomes among patients with previous treatment failure, particularly when treatment decisions are guided by drug-resistance testing and individualized clinical evaluation [14], [25].

Overall, the current review is broadly consistent with previous research showing that ART effectiveness depends not only on the potency of the selected regimen but also on adherence, psychosocial support, and access to continuous healthcare services. The findings therefore support previous evidence that a multidisciplinary and patient-centered approach is necessary to achieve sustained viral suppression and improve long-term treatment outcomes among PLWH.

4. CONCLUSION

This narrative literature review demonstrates that ART is effective in improving clinical outcomes among PLWH through viral load suppression and increased CD4 cell counts. DTG-based regimens showed favorable virological effectiveness compared with conventional regimens. ART effectiveness was also influenced by treatment adherence, with patient knowledge, education, healthcare support, pharmaceutical care, and mHealth interventions associated with better adherence, while psychosocial barriers such as depression and HIV-related stigma may negatively affect treatment outcomes. Overall, effective ART combined with adequate adherence and psychosocial support is essential for achieving optimal treatment outcomes.

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