Dynamics of HIV treatment practices, trends, challenges and future prospects: A structured narrative review

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Abstract

The global response to the scourge of HIV/AIDS has improved significantly over the decades, marked by developments in antiretroviral therapy (ART), advancements in treatment policies, and progress in battling the challenges associated with adherence and access to treatment. This study conducted a narrative review of the Dynamics of HIV/AIDS treatment practices, trends, challenges, and prospects. The study was a narrative review of literature. We searched for articles using three databases: PubMed, Medline, and Google Scholar, from 2000 to January 2025. Studies without clearly defined period, duration, sample size, and location were discarded. International policies significantly impacted access to ARVs by influencing market dynamics, reducing costs, and enhancing access for low-income countries. There was a decline in HIV new infections in Europe, but there are still challenges with drug resistance and the management of co-infections. Non-adherence to ART is commonly associated with certain psychosocial factors such as

depression, lack of social support, and stigma; these factors affect patient outcomes. Depression was a major predictor of ART non- adherence, requiring mental health interventions. Adequate mental support may improve treatment outcomes for HIV-positive patients. Non-adherence to ART, under-staffing, inadequate infrastructure, and poor access to medicines impact negatively on ART. Integrated efforts aimed at tackling HIV related psychosocial challenges such as stigma, mental health, and emerging threats like ART misuse and drug resistance are pivotal areas for future interventions. Long distances to healthcare facilities, systemic or administrative barriers, poor inter professional collaboration also affected patients' response to treatment. By strengthening patient-centered care and integrating mental health and substance abuse services into ART, it is possible to create a more equitable, better optimized, and effective treatment environment for PLHIV.

Keywords: Adherence, HIV, ART, medicines, Public Health, HAART, PLHIV.

Introduction

Over the years, the treatment of HIV has registered very significant progress, with the development of the first antiretroviral drug in the late 1980s to the evolution and introduction of the highly active antiretroviral therapy (HAART) in the mid-1990s, which elicited a paradigm shift in patient care with direct bearing on viral loads decimation and remarkable improvement in life expectancy (Waning et al., 2010).

ART has become the mainstay of HIV treatment, and enabling people living with HIV (PLHIV) to lead healthier lives when all the treatment conditions are strictly adhered to. Moreover, the rapid scale-up of ART programs has played a pivotal role (Poku and Sandkjaer, 2007). International donor agencies: USAID and the Global Fund have been instrumental in achieving this feat. However, HIV/AIDS as a pandemic still continues to be a remarkable public health concern globally, especially in the developing countries with limited resources (Bizimana Rukundo, 2024). Although recent decades have witnessed notable successes in reducing HIV-related morbidity and mortality through ART, the challenges associated with treatment adherence, accessibility, cost, and healthcare management dynamics are still trending.

Access to HIV medicines has depended on global market dynamics, international patent laws, and local healthcare infrastructure (Tian et al., 2023). Though the WHO, through UNAIDS and other organizations, has worked to intervene in global markets to improve access to HIV/AIDS treatment (Waning et al., 2010), the challenges still persist.

Many studies discussed changes in first-line ART regimens, the modifications of integrase inhibitor-based treatment, and retention in care. Others focused on equity, financing, sustainability after donor transition, and dolutegravir scale-up. However, they were largely silent about some operational gaps associated with facility-based treatment practices, internal issues, and challenges that limit HIV management. This study narratively reviewed the Dynamics of HIV/AIDS treatment practices, trends, challenges, and future prospects. We assessed the disparities in ART access across different regions, relating how some variables like healthcare structure, government policies, and socioeconomic conditions impact treatment availability and the limitations that people living with HIV face in adhering to ART. We also explored future prospects in HIV treatment and identified emerging trends, innovations, and strategies that could improve HIV/AIDS pharmacotherapy.

Methods

The review followed a narrative approach to identify existing literature, assess empirical studies, identify emerging trends, synthesize evidence, and identify prospects in

HIV/AIDS treatment practices. We included studies published in the English language, peer-reviewed, and conducted in any part of the globe relating to the topic and populations living with HIV/AIDS. Studies with a defined protocol, either experimental or non-experimental, qualitative or quantitative, and published between 2000 and 2025. The exclusion criteria were studies lacking a clearly defined period, duration, sample size, and location. Studies that focused solely on the prevention of HIV and/or did not address treatment practices were excluded. We also excluded studies with methodological flaws and incomplete data. Keywords were used to search PubMed, Medline, and Google Scholar. The search terms were "Global HIV Treatment Practices", "ART access and adherence", "HIV/AIDS global trends", "Barriers and Issues in HIV Treatment", "Dynamics of HIV/AIDS Treatment and issues", "Dynamics of HIV/AIDS Treatment and trend", "HIV/AIDS Treatment Pattern and Prospect", "Challenges in HIV treatment", Questions were on research titles, research design, disease prevalence, disease burdens, findings, discussions and conclusions.

Results

The extracted data was organized into tables based on the sub-themes on the dynamics and trends of HIV treatment practices, issues and prospects.

Table 1: The dynamics and trends of HIV treatment practices

Reference	Study Title	Methods	Key Findings
Waning et al. (2010)	Intervening in global markets to improve access to HIV/AIDS treatment: an analysis of international policies and the dynamics of global antiretroviral medicines markets	Global market intervention analysis	International policies significantly impacted access to ARVs by influencing market dynamics, reducing costs, and enhancing access for low-income countries.
Bassey & Henry (2021)	Global Stability Analysis of the Role of Antiretroviral Therapy (ART) Abuse in HIV/AIDS Treatment Dynamics	Mathematical modeling	ART (misuse) abuse undermines treatment effectiveness, leading to complications in treatment protocols and affecting global health outcomes.
Bizimana Rukundo (2024)	Epidemiological Trends of HIV/AIDS in Sub- Saharan Africa: A 2024 Perspective	Epidemiological analysis	While significant strides have been made in reducing new infections, particularly through widespread antiretroviral therapy (ART) and targeted prevention programs, the

			region (sub-Saharan Africa)
			continues to bear a disproportionate burden of the global epidemic.
Hardon et al. (2011)	Dynamics of Care, Situations of Choice: HIV Tests in Times of ART	Anthropological study	Decisions surrounding HIV voluntary testing are influenced by the client's perception of ART, which impacts their prospective treatment adherence.
Madeddu et al. (2009)	Trends in the European HIV/AIDS epidemic: a perspective from Italy	Review of surveillance data	There was a decline in HIV/AIDS new infections in Europe, but there are still challenges with drug resistance and the management of co-infections.
Tian et al. (2023)	Global, regional, and national HIV/AIDS disease burden levels and trends in 1990-2019: A systematic analysis for the global burden of disease 2019 study	Systematic analysis of the Global Burden of Disease study	Globally HIV/AIDS burden declined between 1990-2019, but there are still disparities in treatment outcomes across regions, with sub-Saharan Africa most affected.
Shiffman (2008)	Has donor prioritization of HIV/AIDS displaced aid for other health issues?	Policy analysis	Prioritization of HIV/AIDS by donor agencies has led to significant funding increases in respect of HIV/AIDS response but has really led to decline in the resources for other crucial health needs in low-income countries.
Kaisara & Nyabadza (2023)	Modelling Botswana's HIV/AIDS response and treatment policy changes: Insights from a cascade of mathematical models	Mathematical modeling cascade	Policy adjustments in Botswana's HIV/AIDS response showed improvements in treatment cascades but highlighted areas needing enhanced patient retention and adherence strategies.

Table 2: Issues related to HIV treatment practices

Reference	Study Title	Methods	Key Findings/Challenges
Bhatti et al. (2016)	Current Scenario of HIV/AIDS, Treatment Options, and Major Challenges with Compliance to Antiretroviral Therapy.	Review treatment challenges	Medication side effects, stigma, and the complexity of lifelong treatment, especially in resource-limited settings are some of the major challenges in ART adherence.
Kheswa (2017)	Exploring the factors and effects of non-adherence to antiretroviral treatment by people living with HIV/AIDS	Qualitative study	Non-adherence to ART is mostly as a result of certain psychosocial factors such as depression, lack of social support, stigma and all these directly affect patient outcomes.
Aliyu et al. (2019)	Performance and trend for quality of service in a large HIV/AIDS treatment program in Nigeria	Trend analysis of service delivery data	Quality of care in Nigeria's HIV program improved over time, but there are still disparities in service provision, especially in rural settings.
Moshabela et al. (2011)	Patterns and Implications of Medical Pluralism Among HIV/AIDS Patients in Rural South Africa	Qualitative study	HIV patients often use multiple forms of healthcare, like traditional medicine, alongside orthodox ART and this negatively impacts adherence and treatment outcomes
Fontana & Beckerman (2007)	Recently released with HIV/AIDS: primary care treatment needs and experiences	Qualitative study	HIV-positive ex-convicts recently released from incarceration face much barriers in accessing primary care and this increases their risk of poor health outcomes.

Abdulrahman et al. (2019)	HIV Treatment Adherence - A Shared Burden for Patients, Health-Care Providers, and Other Stakeholders	Literature review	HIV treatment adherence demands concerted efforts from patients, healthcare providers, and policymakers to ensure successful long-term (life-long) treatment.
Boyer et al. (2011)	Non-adherence to antiretroviral treatment and unplanned treatment interruption among people living with HIV/AIDS in Cameroon: Individual and healthcare supply-related factors	Cross-sectional study	Some cases of ART non-adherence and treatment interruptions are influenced by healthcare supply issues and call for adequate resource distribution and management as well as provider-patient communication.
Ogoina et al. (2012)	Morbidity and Mortality Patterns of Hospitalized Adult HIV/AIDS Patients in the Era of Highly Active Antiretroviral Therapy: A 4-year Retrospective Review from Zaria, Northern Nigeria	Retrospective review	Irrespective of the advent of HAART, the morbidity and mortality rates still remain high, suggesting the need for improved treatment approaches and better management of comorbid conditions.
Klinkenberg et al. (2004)	Mental disorders and drug abuse in persons living with HIV/AIDS	Cohort study	Mental health disorders and substance abuse impacts negatively on treatment adherence in PLHIV and this underscores the need for integrated care models.
Koto & Maharaj (2016)	Difficulties facing healthcare workers in the era of AIDS treatment in Lesotho	Qualitative study	ART Healthcare providers/workers in Lesotho are faced with a lot of challenges, including high patient load and inadequate resources, which hamper effective HIV care delivery.
Zachariah et al. (2009)	Task shifting in HIV/AIDS: opportunities, challenges and proposed actions for sub-Saharan Africa	Review of healthcare practices	Task-shifting offers a viable solution to healthcare workforce shortages, but it requires careful implementation to ensure uncompromised quality in HIV care delivery to the patients.
Poku & Sandkjaer (2007)	Meeting the Challenges to Scaling up HIV/AIDS Treatment in Africa	Development practice review	Some of the challenges to scaling up of treatment in Africa include resource shortages, political instability, and healthcare infrastructural gaps.

Huang (2013)	Challenges and responses in providing palliative care for people living with HIV/AIDS	Case study review	Palliative care for PLHIV is still underdeveloped, especially in resource- constrained settings, where access to end-of-life care remains a challenge.
Sutton et al. (2010)	HIV testing and HIV/AIDS treatment services in rural counties in 10 southern states: service provider perspectives	Survey of service providers	Healthcare providers in rural areas face challenges in delivering HIV services and are also confronted with issues of limited funding, workforce shortages, and logistical barriers.

Table 3: Prospects and Recommendations for Improved HIV/AIDS Treatment

Reference	Study Title	Methods	Key Findings
Lounsbury et al. (2015)	Simulating Patterns of Patient Engagement, Treatment Adherence, and Viral Suppression: A System Dynamics Approach to Evaluating HIV Care Management	System dynamics approach	Improving patient engagement significantly impacts viral suppression rates and overall treatment outcomes, suggesting the need for enhanced patient- centered approaches.
Gonzalez et al. (2011)	Depression and HIV/AIDS treatment non-adherence: a review and meta-analysis	Meta-analysis	Depression was a major predictor of ART non- adherence, requiring mental health interventions and if such is always adequately provided, it will improve treatment outcomes for HIV- positive patients.
Durvasula & Miller (2014)	Substance abuse treatment in persons with HIV/AIDS: challenges in managing triple diagnosis	Literature review	Managing individuals with HIV and substance abuse is complex and an integrated approach towards addressing the triple diagnosis of HIV, mental health, and substance abuse will significantly improve patients outcomes.
Weeks et al. (2020)	Simulating system dynamics of the HIV care continuum to achieve treatment as prevention	System dynamics simulation	Improved system dynamics can enhance patient engagement in the HIV care continuum, emphasizing treatment as prevention and optimizing healthcare resource allocation.
Lewis (2005)	Addressing the Challenge of HIV/AIDS: Macroeconomic, Fiscal and	Macroeconomic analysis	Adequately coordinated efforts between health, fiscal, and institutional policies will ensure sustainable funding

	Institutional Issues		and effective resource allocation towards fight against HIV/AIDS.
Airaoje et al. (2024)	Review factors associated with continuity of HIV treatment in Nigeria	Scoping review	Patients outcomes will improve by addressing factors impacting continuity and retention in care; health system barriers, social stigma, and patient-provider relationships.
Nachega et al. (2023)	Long-acting antiretrovirals and HIV treatment adherence	Scoping review	Long-acting antiretroviral therapy will become a standard treatment option for people living with HIV; four long-acting antiretrovirals are currently available in some countries, and many more are in development.

Discussion

Dynamics, patterns, and trends of HIV treatment practices

Dynamics, Patterns, or Trends of HIV treatment practices are influenced by a variety of factors, including socioeconomic status, political environment, healthcare system efficiency, and geographical disparities. The global epidemiology of HIV is characterized by regional disparities. Sub-Saharan Africa remains the epicenter of the disease, accounting for nearly two-thirds of all new HIV infections and AIDS-related deaths (Bizimana Rukundo, 2024). Countries like Botswana have implemented comprehensive ART programs, though they still face challenges of treatment adherence and long-term viral suppression (Kaisara & Nyabadza, 2023). Studies were silent about resistance surveillance and viral load monitoring, which are essential in HIV management. In contrast, some global regions like the European countries have witnessed dwindling infection rates, but they continue to battle with the issues of treatment coverage among marginalized people (Madeddu et al., 2009).

In developed countries, HIV is a chronic, manageable condition due to widespread access to ART and optimal levels of healthcare infrastructure. However, the situation is different in developing countries, where healthcare systems are poorly-funded almost always, and ART coverage remains grossly insufficient (Poku & Sandkjaer, 2007). Besides, the trend of medical pluralism is obtainable in certain regions, such as rural parts of Nigeria and South Africa, where patients seek treatment from both orthodox and non-skilled traditional healthcare providers. This complicates ART adherence and continuity of care (Moshabela et al., 2011).

Issues related to HIV treatment practices

In many underdeveloped regions of Africa, access to HIV treatment is hampered by long distances to the locations of healthcare facilities, with the attendant poor infrastructure and many instances of very suboptimal healthcare resources (Moshabela et al., 2011; Sutton et al., 2010). Inadequate and poor ART coverage and poor healthcare systems were common, especially in places overwhelmed by a huge number of HIV patients in need of treatment (Bassey & Henry, 2021; Koto & Maharaj, 2016). In many low-resource settings, patients must navigate complex healthcare systems, where access to ART is limited by supply chain disruptions, healthcare worker shortages, industrial action, political insurgencies and

inadequate infrastructure (Aliyu et al., 2019). The challenge of high patient volume and limited skilled healthcare workers has led to the adoption of various coping strategies such as task shifting, which involves delegating some less complex responsibilities to less specialized healthcare workers to ensure continuity of care (Zachariah et al., 2009).
Non-adherence to ART was another critical issue in the global HIV/AIDS response. Cases of non-adherence to HIV medications was linked to several patient-related factors, such as depression, substance abuse, stigma, and systemic or administrative barriers like healthcare supply shortages and poor patient-provider communication (Kheswa, 2017 and Gonzalez et al., 2011). Studies have shown that in Cameroon (Central Africa), individual and healthcare supply-related factors contribute to the interruption of unplanned treatment. These, in addition to long-acting injectables, additionally complicate HIV management (Boyer et al., 2011). Some of these complications, according to Gonzalez et al. (2011), include drug resistance, increased viral loads, and an increased risk of transmission, and this necessitates the need for comprehensive approaches to patient care.

HIV/AIDS treatment is also undermined by the concurrence of mental health issues and substance abuse, and these are common among PLHIV (Klinkenberg et al., 2004). One of the studies (Durvasula & Miller, 2014) opined that managing these co-morbidities requires an integrated and coordinated approach to care, which is often lacking in many healthcare settings, especially in Sub-Saharan Africa. This is usually related to the stigma and discrimination associated with HIV/AIDS. Sustainability was a huge problem after donors transitioned. They continue to pose huge barriers to both testing and treatment adherence. Unfortunately, despite all the global efforts at reducing stigma and discrimination related to HIV, many PLHIV still experience discrimination in healthcare settings, and this discourages them from seeking treatment or adhering to the prescribed ART regimens (Bhatti et al., 2016). These underscore the need for improved differentiated care services, equity financing, and sustainability, especially after donors transition.

Prospects for HIV treatment

The prospect of better outcomes in HIV care and treatment holds great promise, with a lot of discoveries and innovations toward improved patients' care. Recent advances in the development of long-acting antiretroviral drugs and sustained-release injectable ART formulations. They have the potential to transform treatment adherence by reducing the frequency of drug administration (Nachega et al., 2023). The use of system dynamics models to simulate HIV care management has provided valuable insights into the optimization of interventions to improve patient involvement in HIV care (Weeks et al., 2020). A study by Lawson modeled treatment scenarios, settings and the effects of ART on patient outcomes (Lawson, 2005). It examined treatment progression in the HIV/AIDS epidemic using mathematical models, emphasizing the importance of early ART initiation and consistent adherence.

More recent models have even explored the impacts of policy changes on HIV/AIDS treatment outcomes, and this provides insights into how various interventions can alter the course of the epidemic (Kaisara & Nyabadza, 2023; Udoh, 2025). The global health community continues to research new strategies at enhancing ART coverage and reduction of barriers to access. For instance, the laudable integrations of ART services with other healthcare programs eg tuberculosis, malaria, and maternal health services, have improved treatment outcomes (Bertozzi et al., 2011). Engagement of mobile health technologies and overall pursuit of differentiated ways of rendering care, eg the community-based healthcare approaches, are promising as potential solutions to the challenges of ART access and delivery to

underserved areas (Fontana & Beckerman, 2007).

Limitations of the study

The study was a narrative review and did not incorporate most of the methodological rigors and quality assessment applicable to systematic review in the extraction of the articles used. This may have led to some level of bias and incomplete extraction of relevant articles. This may also have affected the heterogeneity of included study design. English Language restriction and broadness of review question may have excluded some articles of interest.

Conclusion

Progress was made in the global response against HIV/AIDS. However, the dynamics of treatment practices remain complex and multifaceted. The challenges of ART treatment practices spanned patients' non-adherence, healthcare personnel, infrastructural capacity deficits, and poor access to medicine. HIV related psychosocial challenges such as stigma, mental health, and emerging threats like ART misuse and drug resistance are pivotal areas limiting treatment. Well-coordinated collaborative efforts among healthcare providers were lacking. Complex healthcare systems and supply chain disruptions disrupt HIV services. Long distances to healthcare facilities, systemic or administrative barriers eg healthcare supply shortages, and poor patient-provider communication also affected patients' response to treatment. Studies were silent about retention in care, scale-up, and changes in first-line ART treatment.

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