

REVIEW

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A scoping review of barriers and facilitators of antiretroviral therapy adherence in Sub-Saharan Africa, 2000–2024

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Abstract

Background Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) remains a major global public health challenge, with an estimated 25.6 million people living with HIV and 380,000 AIDS-related deaths reported in 2022. Although antiretroviral therapy is highly effective in suppressing viral replication and improving survival, optimal adherence remains difficult to achieve across Sub-Saharan Africa. This review mapped existing evidence on barriers and facilitators influencing antiretroviral therapy adherence in the region.

Methods This review was conducted in line with the Arksey and O'Malley framework and reported in accordance with the PRISMA-ScR. Peer-reviewed studies published between 2000 and 2024 were retrieved from PubMed, African Journals Online, Dimensions AI, CINAHL, and JSTOR. Studies reporting barriers and facilitators of antiretroviral therapy adherence in Sub-Saharan Africa were eligible for inclusion.

Results A total of 61 studies were included in this review. Findings reported adherence levels ranged from 25.07% in Kenya to 87.1% in Uganda. Barriers to adherence included socioeconomic constraints such as financial hardship, competing work demands, and food insecurity; healthcare system challenges including limited access to antiretroviral therapy, service inefficiencies, and negative provider attitudes; and psychosocial and individual factors such as stigma, inadequate social support, forgetfulness, and complex treatment regimens. Facilitators consistently identified included strong family and community support, trust in the effectiveness of antiretroviral therapy, and improvements in healthcare infrastructure and service delivery.

Conclusion Antiretroviral therapy adherence in Sub-Saharan Africa is shaped by interacting individual, social, and health system factors. The findings underscore the need for integrated, context-responsive strategies that strengthen health system performance, reduce socioeconomic vulnerability, and leverage family and community support structures. However, interpretation of the evidence is limited by restriction to English-language publications, heterogeneity in study designs and adherence measures, and the absence of formal quality appraisal, highlighting priorities for future research.



Keywords Anti-retroviral therapy, ART adherence, Sub-Saharan Africa, Barriers, Facilitators

1 Introduction

HIV/AIDS remains a global health challenge, with over 25.6 million people living with HIV and 380,000 people dying from AIDS-related illnesses in 2022 [1, 2]. Sub-Saharan Africa continues to carry a disproportionate burden, accounting for approximately 53% of global cases in 2010 [1, 2]. Although antiretroviral therapy coverage has reached nearly 75% in Sub-Saharan Africa, adherence remains suboptimal [1]. This threatens the success of treatment programmes and undermines progress towards global HIV targets. The prevalence of HIV in Sub-Saharan Africa underscores the disproportionate burden faced by the region. For example, South Africa has the largest national HIV epidemic in the world, with an estimated 7.9 million people living with HIV, yet the burden of the disease is not evenly shared across the country's population [3].

Adherence to Anti-Retroviral Therapy (ART) is pivotal for managing HIV/AIDS effectively, yet it remains a persistent challenge in Sub-Saharan Africa, [4, 5] where the disease's burden is most severe. ART adherence ensures viral suppression, reduces HIV-related morbidity and mortality, and prevents the emergence of drug-resistant HIV strains [6]. Studies have demonstrated that consistent ART use reduces viral load to undetectable levels, which significantly lowers the risk of transmission to sexual partners and from mother to child [7, 8]. Moreover, ART improves immune function, reduces opportunistic infections, and enhances the quality of life for individuals with HIV [9]. The importance of ART extends beyond individual benefits to societal impacts. Scaling up ART programs has been linked to declining HIV-related mortality and morbidity in Sub-Saharan Africa [10]. For instance, the scale-up of ART in Rwanda has increased life expectancy by 25 years of life expectancy between PLHIV and reduced 78% of AIDS-related deaths [11].

Despite extensive research examining antiretroviral therapy adherence, including individual-, social-, and health system-related determinants, the existing evidence remains fragmented and unevenly distributed across Sub-Saharan Africa [10, 12–15]. Much of the literature is confined to single-country studies or specific population groups such as adolescents, pregnant women, or key populations [16–19], limiting the ability to synthesise regional patterns or draw transferable conclusions. In addition, prior reviews have frequently examined barriers or facilitators in isolation [20–22], rather than providing an integrated perspective that captures their concurrent influence within diverse sociocultural and health system contexts. Furthermore, to the best of our knowledge, no previous scoping review has explicitly applied the Socio-Ecological Model to examine antiretroviral therapy adherence, thereby limiting a comprehensive understanding of how individual, interpersonal, community, and health system factors interact to shape adherence behaviours. This scoping review addresses these gaps by systematically mapping both barriers and facilitators across multiple Sub-Saharan African countries, while also offering an interpretive synthesis of patterns across study designs, population groups, and contexts. Importantly, these contributions align with the Sustainable Development Goals, particularly target 3.3, which aims to end the AIDS epidemic by 2030, by

generating contextually relevant evidence to strengthen treatment adherence, improve viral suppression, and promote equitable access to HIV care across the region.

1.1 Conceptual framework

The Socio-Ecological Model provides a comprehensive framework for interpreting the multi-level determinants of antiretroviral therapy adherence identified in this review by demonstrating how individual, social, structural, and health system factors interact to shape treatment outcomes. Rather than viewing adherence as solely dependent on personal behaviour, existing evidence shows that individual-level factors such as knowledge, motivation, psychological well-being, and treatment-related experiences are closely influenced by social dynamics including stigma, disclosure, and the availability of family and peer support [9, 16]. These influences are further embedded within broader structural conditions, such as poverty, food insecurity, transport challenges, and sociocultural norms, which either enable or constrain access to care and the ability to sustain treatment routines [47, 51, 70]. At the same time, health system factors including service accessibility, drug availability, provider attitudes, and quality of care play a critical role in either reinforcing or mitigating these challenges [26, 27]. Importantly, the evidence indicates that these levels operate cumulatively rather than independently, such that barriers at one level often intensify difficulties at others, while supportive conditions can buffer constraints across levels [12, 28]. This interconnected dynamic underscores the need for integrated, multi-level interventions that simultaneously address individual behaviours, strengthen social support systems, reduce structural inequities, and enhance health system responsiveness to improve adherence outcomes in Sub-Saharan Africa (Fig. 1).

2 Methods

This scoping review was conducted following the methodological framework outlined by Arksey and O'Malley [29] and adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) [30]. The PRISMA-ScR checklist, included as a supplementary file, ensures comprehensive and transparent reporting, thereby enhancing the credibility

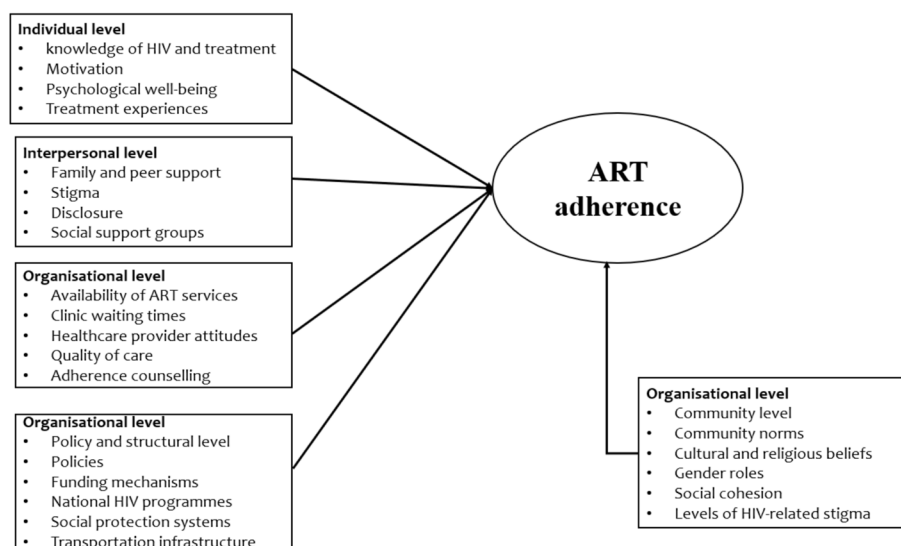


Fig. 1 Conceptual framework based on SEM (Author's Creation)

and reliability of the review process. Arksey and O'Malley's approach comprises six iterative stages: (1) defining the research question, (2) identifying relevant literature, (3) selecting studies, (4) extracting and organising data, (5) synthesising and reporting findings, and (6) an optional consultation phase. However, although not part of the original framework, a seventh stage appraisal of included studies has been recommended by subsequent scholars, including Levac et al. [31] and the Joanna Briggs Institute [32], to enhance methodological rigour.

2.1 Review question

This review was guided by three research questions: (1) what is the level of adherence to ART among individuals in Sub-Saharan Africa? (2) what are the barriers to ART adherence in Sub-Saharan Africa? and (3) what are the facilitators of ART adherence in Sub-Saharan Africa?

2.2 Identifying relevant studies

To ensure the inclusion of relevant studies, a systematic search was conducted in five primary databases which include PubMed, African Journals Online (AJOL), Dimensions AI, CINAHL, and JSTOR. Additionally, supplementary searches were performed using Google Scholar and Google to identify grey literature and reports from international health organisations. These databases were selected based on their extensive coverage of biomedical, public health, and multidisciplinary research related to ART adherence. The initial search was conducted in PubMed, utilising Medical Subject Headings (MeSH) terms in combination with keywords and controlled vocabularies to comprehensively retrieve relevant articles (Table 1). These MeSH terms were chosen for their indexing relevance in PubMed, PubMed Central, and MEDLINE, ensuring the inclusion of

Table 1 Search strategy for search in the various databases

Database	Search string
PubMed	("Anti-Retroviral Agents"[MeSH] OR "Anti-HIV Agents"[MeSH] OR "HIV Infections/drug therapy"[MeSH] OR antiretroviral therapy OR ART OR HAART OR cART OR ARV) AND ("Medication Adherence"[MeSH] OR "Patient Compliance"[MeSH] OR "Treatment Adherence and Compliance"[MeSH] OR adherence OR compliance OR concordance OR retention) AND ("Health Services Accessibility"[MeSH] OR "Patient Acceptance of Health Care"[MeSH] OR "Health Knowledge, Attitudes, Practice"[MeSH] OR barrier* OR facilitator* OR challenge* OR enabler* OR support*) AND ("Sub-Saharan Africa"[MeSH] OR "Africa South of the Sahara" OR Angola OR Benin OR Botswana OR Burkina Faso OR Burundi OR Cameroon OR Cape Verde OR Central African Republic OR Chad OR Comoros OR Congo OR "Democratic Republic of the Congo" OR Djibouti OR Equatorial Guinea OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR Guinea-Bissau OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mozambique OR Namibia OR Niger OR Nigeria OR Rwanda OR Senegal OR Sierra Leone OR Somalia OR South Africa OR South Sudan OR Sudan OR Tanzania OR Togo OR Uganda OR Zambia OR Zimbabwe) NOT animals
African journals online (AJOL)	("antiretroviral therapy" OR ART OR HAART OR ARV) AND (adherence OR compliance OR retention) AND (barrier* OR facilitator* OR enabler* OR challenge*) AND ("Sub-Saharan Africa" OR Africa OR Ghana OR Kenya OR Nigeria OR Uganda OR South Africa OR Ethiopia OR Tanzania OR Zambia OR Malawi)
Dimensions AI	("antiretroviral therapy" OR ART OR HAART OR ARV) AND (adherence OR compliance OR retention) AND (barrier* OR facilitator* OR enabler*) AND ("Sub-Saharan Africa" OR Africa)
Cumulative index to nursing and allied health literature (CINAHL)	(MH "Antiretroviral Therapy" OR "antiretroviral therapy" OR ART OR HAART) AND (MH "Medication Adherence" OR adherence OR compliance) AND (barrier* OR facilitator* OR support* OR enabler*) AND ("Sub-Saharan Africa" OR Africa OR Ghana OR Kenya OR Nigeria OR Uganda OR South Africa)
JSTOR	("antiretroviral therapy" OR ART OR HAART) AND (adherence OR compliance) AND (barrier* OR facilitator*) AND ("Sub-Saharan Africa" OR Africa)

various terminological variations related to barriers and facilitators of ART adherence. The search strategy developed for PubMed was subsequently adapted and refined for use in other databases to facilitate a comprehensive exploration of the literature across different fields. To enhance the search scope, reference lists of selected studies were reviewed to identify additional relevant articles. The search process was conducted on November 11, 2024.

2.3 Study selection

Articles retrieved from database searches were imported into Mendeley for reference management and duplicate removal. The selection process followed predefined inclusion and exclusion criteria to ensure alignment with the research objective of the review (Table 2). The title and abstract screening were conducted by G.O.O., B.N., and G.I.A., who applied the eligibility criteria rigorously. Studies meeting the criteria advanced to the full-text review, which was independently conducted by A.A., F.O.O., A.N.N., and J.P.G. Disagreements at any stage were resolved through discussion or arbitration by M.A. and P.D.F. to ensure impartiality and methodological rigour. This reduced the possibility of bias and made sure that only pertinent studies that satisfied the eligibility requirements were included in the review by guaranteeing consistency and precision in the research selection process.

2.4 Inclusion and exclusion criteria

2.5 Data charting/extraction

Data extraction forms were designed and piloted by A.A. and F.O.O. using three studies to refine the extraction process and ensure reliability and consistency before application to the full dataset. The extraction form captured information on author(s) and year of publication, country, study purpose, study design, population and sample size, adherence measures, and key findings relating to barriers and facilitators. Data extraction was conducted independently by A.A., A.N.N., and F.O.O., after which the extracted data were reviewed by G.O.O., G.I.A., and B.N. to ensure accuracy, consistency, and

Table 2 Inclusion and Exclusion Criteria

	Inclusion criteria
1	Studies involving people living with HIV (PLHIV) of any age group and caregivers or healthcare providers directly address ART adherence
2	Studies conducted in Sub-Saharan African countries
3	Peer-reviewed articles, grey literature, and reports
4	Articles published in English
5	Studies reporting barriers and facilitators to ART adherence
	Exclusion criteria
1	Studies involving populations outside Sub-Saharan
2	Studies conducted outside of or irrelevant to Sub-Saharan Africa
3	Opinion pieces, editorials, inaccessible grey literature, pre-prints, or studies with no primary data or empirical analysis
4	Studies published in languages other than English language
5	Studies with no specific focus on barriers or facilitators
6	Studies not directly addressing ART adherence

completeness before analysis and synthesis. Any discrepancies identified were resolved through discussion during weekly review meetings, thereby maintaining methodological rigour throughout the process.

2.6 Collating, summarising, and reporting results

The process of collating involved organising the extracted data into structured categories based on emerging themes, ensuring that related information was grouped systematically for clarity and comprehension. This approach facilitated the development of a cohesive overview, allowing for the identification of patterns, trends, and variations across the studies. Summarising entailed refining the structured data into concise and insightful key points, highlighting recurring themes, significant patterns, and notable findings. This step aimed to present essential information in a clear and meaningful way while maintaining the integrity and relevance of the data. Reporting the results involved communicating the synthesised findings through narratives, tables, and figures, ensuring that key insights were effectively conveyed. The objective was to provide a comprehensive yet accessible summary of the reviewed literature, aligning with the study's objectives. Throughout these stages, a systematic and transparent approach was maintained, adhering to established research protocols to ensure accuracy, consistency, and reliability in the presentation of findings.

2.7 Consultations

A qualified librarian supported the development and refinement of the search strategy during the searching and screening stages, enhancing the comprehensiveness, accuracy, and methodological soundness of study identification on barriers and facilitators to anti-retroviral therapy adherence in Sub-Saharan Africa. The protocol of this review has been registered on Open Science Framework with the DOI: <https://doi.org/10.17605/OSF.IO/3PVQH>.

2.8 Appraisal of studies

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, which provide structured checklists tailored to different study designs and are widely applied in evidence synthesis to evaluate the rigour and credibility of empirical research [33]. The appraisal was conducted to evaluate the methodological strength of the evidence rather than to exclude eligible studies from the review. For mixed-methods studies, the JBI checklist comprises ten items, eight items focusing on clearly defined inclusion criteria, a detailed description of study participants and settings, valid and reliable measurement of exposures and outcomes, identification of potential confounding factors, and the appropriateness of statistical analysis [33]. Based on the scoring framework, studies were categorised as high quality (scores 8–10), moderate quality (scores 5–7), or low quality (scores ≤ 4) [33, 34]. In addition, the Mixed Methods Appraisal Tool (MMAT) version 2018 was used to further evaluate studies employing mixed methods designs, particularly to assess the methodological coherence between qualitative and quantitative components and the integration of findings [35]. Four reviewers independently conducted the appraisal to enhance methodological rigour and minimise bias. The initial assessment was performed by A.A. GOO, BN and F.O.O., while senior authors M.A., C.A and P.F.D. provided oversight to ensure

consistency and objectivity. Any discrepancies in scoring were resolved through discussion and consensus among the reviewers, and a detailed summary of the quality assessment is presented in Appendix A.

3 Results

3.1 Search results

A total of 5,595 records were identified initially, from five database searches and 20 from other sources. Duplicate records, numbering 5,021, were removed. After screening 594 titles and abstracts, 522 records were excluded. Thereafter, 72 full-text articles underwent further consideration. Additional references from consultations added 12 more eligible full-text records. This brought the cumulative records to 84 full texts for critical screening. From these, 23 records were excluded for specified reasons, leaving 61 records that formed the inclusion in this scoping review. The PRISMA flowchart is shown in Fig. 2.

3.2 Characteristics of included studies

Most of the included studies were conducted in South Africa (13), followed by Uganda (9), Ghana (6), Kenya (5), Nigeria (5), and Zambia (5). Ethiopia and Tanzania had 4 studies each, while Zimbabwe had 3 studies. Botswana, Cameroon, Eswatini, Malawi, Mozambique, Namibia, and Sierra Leone had 1 study each. See details in Fig. 3. Out

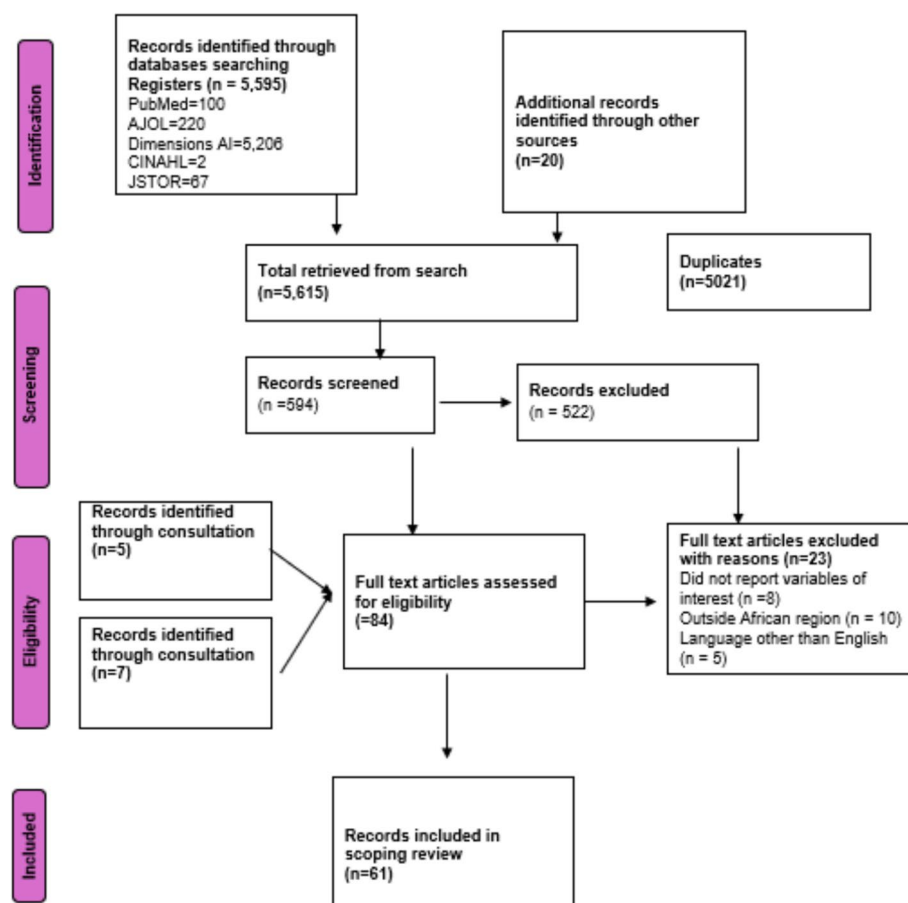


Fig. 2 PRISMA flowchart of the search and screening results

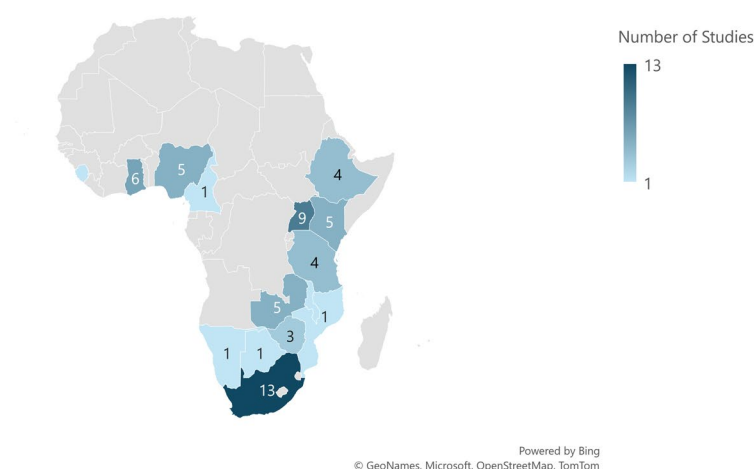


Fig. 3 Countries where included studies were conducted

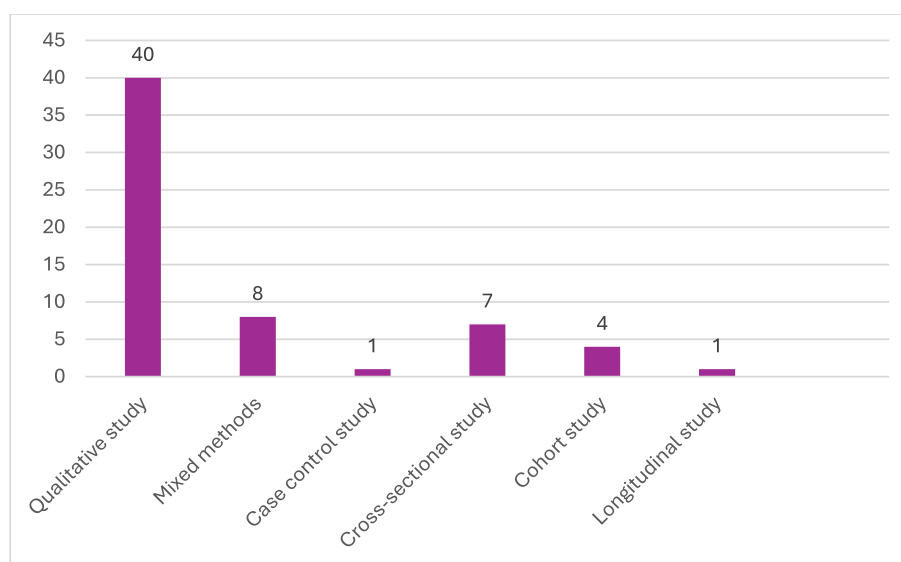
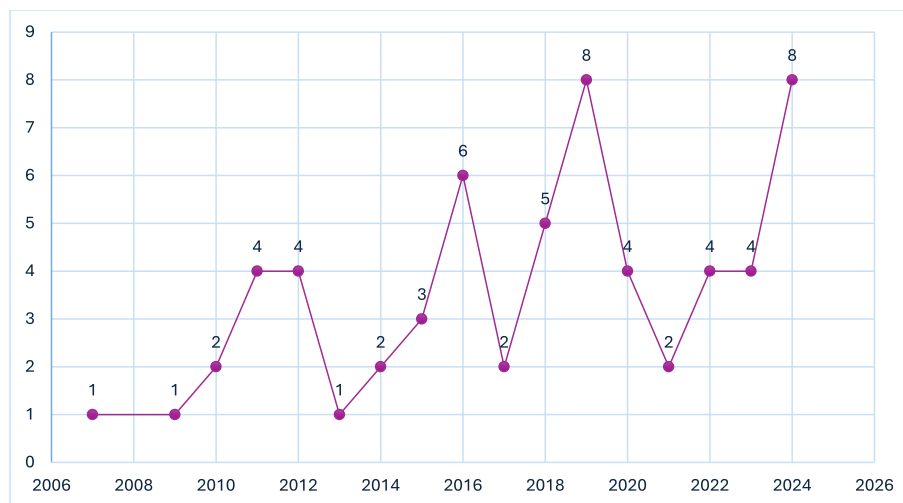
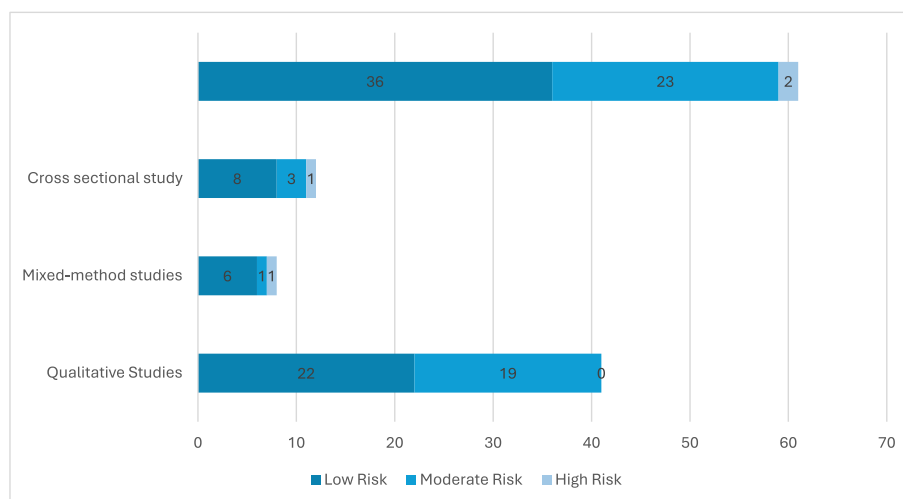


Fig. 4 Designs used in the included studies

of the 61 included studies, the majority were exploratory qualitative studies (35), followed by mixed methods (8), cross-sectional studies (7), descriptive qualitative studies (5), cohort studies (4), case-control studies (1), and longitudinal studies (1). See Fig. 4 for details. A total of 61 studies were published between 2007 and 2024, with the highest number of studies published in 2019 and 2024 (8 studies each), followed by 2016 (6 studies) and 2018 (5 studies). See Fig. 5 for details.

3.3 Appraisal results of included studies

The appraisal of included studies indicates an overall high methodological quality across the evidence base, with most cross-sectional studies assessed using the JBI tool scoring between 7/8 and 8/8, thereby reflecting strong internal validity and appropriate statistical analysis. However, notable methodological limitations were observed, particularly regarding the identification and management of confounding factors, which were absent in several studies such as Mayanja et al. [36] and Okoye et al. [37], potentially

**Fig. 5** Years of included studies**Fig. 6** Appraisal results of included studies

affecting the robustness of their findings. A small number of studies, including Jonathan [38], were rated as low quality due to weaknesses in exposure measurement, confounding control, and analytical rigour. In the MMAT assessment, most studies demonstrated high quality (4/5 or 5/5), although some, such as Buyu et al. [39], showed poor to moderate integration of qualitative and quantitative components and limited consideration of divergences between findings. Similarly, qualitative studies appraised using JBI criteria were largely of high quality, with scores ranging from 8/10 to 10/10, though recurring limitations included inadequate consideration of researcher influence and reflexivity in several studies, including Kheswa [40] and Coetzee et al. [41]. Despite minor methodological weaknesses, the body of evidence demonstrates considerable rigour and provides a reliable foundation for synthesis and interpretation. The results of the appraised studies were categorised into low, moderate, and high quality, as presented in Appendix B (Fig. 6).

3.4 Level of adherence to ART

The reviewed studies reported adherence levels ranging from 25.07% in Kenya [42] to 87.1% in Uganda [43]. Few studies documented low adherence levels, including Kenya [42] at 25.07% and Ghana [44] at 42.9%. Several studies indicated moderate adherence, such as Ethiopia [45] at 50.0%, Uganda [36] at 51%, and Zambia [46] at 59.9%. Higher adherence was observed in South Africa [47] at 65%, South Africa [48] at 69.0%, and Ghana [49] at 73%. Studies reporting the highest adherence levels included Botswana [50] at 75.6% and Uganda [43] at 87.1% (See Table 3).

3.5 Barriers to ART adherence

Barriers to ART adherence were synthesised into four major thematic domains individual, social, structural, and health system levels reflecting the complex and interrelated factors influencing treatment continuity.

3.6 Individual-level barriers

At the individual level, adherence is influenced by a complex interplay of psychological, behavioural, cognitive, and clinical factors. Emotional and psychological challenges, including distress and mental health burdens, were consistently associated with poor

Table 3 Level of adherence to ART

Authors, year, countries	Purpose of the study	Study design	Population	Sample size	Adherence level
Ondiek et al. [42] Kenya	To establish the determinants of adherence to ART among discordant couples	Mixed methods	HIV infected clients	385	25.07%
Prah et al. [49] Ghana	To investigate the level of adherence to ART, and assess factors that influence adherence to antiretroviral therapy	Cross-sectional study	HIV/AIDS patients on ART	381	73%
Sasaki et al. [46] Zambia	To identify predictive factors associated with ART adherence during the early months of treatment	Longitudinal study	ART-naïve and newly registered for ART services aged 16 and over	241	59.9%
Sefah et al. [44] Ghana	To assess current ART adherence levels and its determinants among patients, including current barriers and enablers	Mixed methods	HIV patients aged at least 18 years	231	42.9%
Adeniyi et al. [48] South Africa	To examine adherence levels and reasons for non-adherence during pregnancy	Mixed methods	HIV infected parturient women	1,709	69.0%
Curioso et al. [45] Ethiopia	To develop a better insight into adherence among HIV-positive women on ARV treatment	Exploratory qualitative study	HIV-positive individuals	14	50.0%
Majanja et al. [36] Uganda	To study specific personal barriers to ART adherence	Cohort study	Adult HIV patients	35	51%
Nabukeera-Barungi et al. [43] Uganda	To explored the barriers and facilitators of adherence to ART	Mixed Methods	adolescents living with HIV	1824	87.1%
Ndiaye [50] Botswana	To determine the level of adherence among HIV infected adolescents on ART and to identify barriers associated with non-adherence	Cross-sectional study	HIV infected children aged between 13 and 18 years	82	75.6%
Nhlonholwane and Shonisani [47] South Africa	To identify predictors and barriers associated with ART non-adherence amongst HIV patients attending an adult antiretroviral clinic	Cross-sectional study	Adult patients aged 18 and above	240	65%

adherence [23–28, 39, 44–47, 53, 55–64]. Behavioural factors such as poor adherence practices, forgetfulness, treatment fatigue, and substance use further disrupted consistent medication-taking routines [28, 45–49, 52–54, 57–62, 67–76]. Limited awareness, inadequate information, denial, and misinformation also contributed to suboptimal adherence behaviours [24, 26, 28, 37, 40, 42, 45, 49, 52, 54, 56–59, 63, 64, 67, 69, 71, 77, 78]. Treatment-related challenges, including side effects and regimen complexity, significantly discouraged sustained adherence [24, 26–28, 42, 44–46, 49, 50, 53–55, 59, 61, 62, 64, 65, 68, 73–76, 78–84]. Additionally, age-related factors, co-infections such as tuberculosis, and other underlying health conditions further complicated adherence behaviours [40, 45, 53, 71, 85].

3.7 Social-level barriers

At the social level, stigma, misconceptions, and discrimination were among the most pervasive barriers, creating fear and reluctance to engage with ART services [28, 29, 31, 49–55, 59, 60, 62, 66–68, 70, 72, 74–77]. Non-disclosure of HIV status, often driven by fear of social rejection, limited access to social and emotional support systems and contributed to poor adherence [27, 40, 58, 60, 64, 79, 81]. Social isolation and community opposition further weakened adherence by reducing the availability of supportive networks [44, 70, 79]. These social dynamics collectively reinforced secrecy and hindered sustained engagement with treatment.

3.8 Structural-level barriers

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3.9 Structural barriers

Structural barriers were largely shaped by socioeconomic, environmental, and cultural constraints. Financial difficulties, including inability to afford transportation and basic needs, significantly limited access to treatment services [23–28, 39, 41, 45, 46, 48, 49, 55–58, 61, 66, 68, 69, 71, 78, 80, 82, 83, 87, 88, 90]. Work and household responsibilities, as well as academic commitments, further restricted the ability to attend clinic appointments and adhere to treatment schedules [26–28, 41, 46, 47, 49, 55, 58, 59, 82, 84, 87]. Food insecurity emerged as a critical barrier, affecting patients' ability to take medication consistently [23–27, 39, 41, 42, 45, 47, 49, 53, 58, 59, 62, 66, 70, 75, 83, 87, 90]. Geographic barriers, travel and mobility challenges, and clinic accessibility issues also hindered consistent engagement with care [28, 41, 46, 53, 55, 63, 67–69, 76, 87, 90]. Additionally, cultural and religious beliefs, reliance on alternative medicine, language barriers, and gender and relationship dynamics influenced adherence behaviours and decision-making [24, 26, 40, 42, 45, 46, 49, 50, 55–58, 66, 67, 70–72, 75, 76, 78, 82, 84, 86,

89]. Institutional and organisational limitations, including workforce and service delivery constraints, further compounded these challenges [24, 42, 59, 62–64, 67, 70, 77, 84, 90].

3.10 Health system-level barriers

At the health system level, multiple service delivery and organisational challenges impeded adherence. Accessibility and infrastructure issues, including limited-service points and logistical constraints, reduced service utilisation [23, 27, 38, 39, 45, 47–49, 53, 56, 59, 61–63, 67, 69–71, 75, 78, 80, 82, 83, 87, 89]. Health system inefficiencies such as staff shortages, poor coordination, and weak service delivery further compromised care quality [23, 24, 26, 28, 38, 39, 41, 45, 46, 49, 53–55, 57, 59–62, 64, 66–68, 70, 72, 74, 75, 77, 80–85]. Negative healthcare provider attitudes, poor communication, and weak patient–provider relationships discouraged sustained engagement with treatment services [28, 41, 46, 49, 55, 57, 62, 67, 70, 74, 75, 77, 78, 87]. In addition, limited antiretroviral therapy service delivery, inadequate adherence support, clinic-related challenges, and drug accessibility issues contributed to treatment interruptions and suboptimal adherence outcomes [24, 27, 28, 37, 40, 41, 45, 49, 50, 53, 54, 57, 58, 61–63, 70, 73, 75, 77, 78, 81, 83] (See Table 4).

Analysis of the included studies demonstrates notable variation in how barriers to antiretroviral therapy adherence are identified across study designs and population groups. Qualitative studies, which constituted the majority [26, 70, 72, 89], predominantly reported psychosocial and relational barriers, including stigma, fear of disclosure, cultural beliefs, and patient–provider interactions. In contrast, quantitative and cross-sectional studies [25, 28, 50, 60] more frequently identified measurable determinants such as socioeconomic status, food insecurity, and healthcare access. Cohort and longitudinal studies [23, 37, 47] highlighted the persistent influence of structural constraints, particularly transport challenges, service accessibility, and continuity of care. Variation was also observed across population groups, with adolescents and young people [44, 68, 84] more commonly experiencing disclosure difficulties, peer stigma, and school-related barriers, while adults [40, 71, 80] were more affected by competing livelihood demands and treatment fatigue. Additional barriers were reported among pregnant women and rural populations, reflecting gender-related and contextual vulnerabilities.

3.11 Facilitators that enhance ART adherence

Facilitators of ART adherence were synthesised into four major thematic domains individual, social, structural, and health system levels highlighting the multi-level enablers that support sustained treatment engagement.

3.12 Individual-level facilitators

The review indicates that, at the individual level, adherence is strengthened by a combination of psychological, behavioural, cognitive, and experiential factors. Perceived improvements in health and prolonged life expectancy emerged as key motivators for sustained adherence [24, 26, 71, 74, 75, 86, 87]. Trust in antiretroviral therapy (ART) efficacy and recognition of its benefits further reinforced positive adherence behaviours [23, 27, 45, 46, 55, 56, 59, 71–73, 75]. Individuals who demonstrated effective coping strategies and strong intrinsic motivation were more likely to maintain consistent medication

Table 4 Barriers to ART adherence

Main themes	Sub-theme	Authors
Individual-level barriers	Age-related barriers	[39, 44, 51]
	Poor adherence behaviours	[50, 52]
	Emotional and psychological	[23, 26–28, 38, 43–46, 51, 53–61]
	Psychological burdens	[62]
	Social support deficiencies	[23, 27, 38, 48, 59, 60, 63–65]
	Forgetfulness and treatment fatigue	[28, 44–47, 53, 56, 58–61, 65–73]
	Substance use	[48, 51, 53, 55–58, 73, 74]
	Lack of awareness and information	[24, 39, 44, 48, 52–56, 60, 62, 65, 67, 75]
	Denial, misinformation and beliefs	[24, 26, 36, 41, 50, 69, 76]
	Side effects and regimen complexity	[24, 26–28, 41, 43–45, 48, 49, 51–53, 56, 58, 59, 61–63, 66, 71–74, 76–81]
	Complex regimens	[43, 44, 48, 49, 52, 59, 66, 67, 81, 82]
	Tuberculosis and coinfections	[83]
	Health conditions	[69]
Social level barriers	Stigma and misconception, discrimination	[23–28, 38, 40, 43–45, 48, 51, 53–56, 58–61, 65, 66, 68, 72–74, 76, 78–88]
	Community opposition	[24]
	Non-disclosure	[36, 49, 51, 52, 55, 56, 58–61, 64, 66, 70, 82, 84]
	Social isolation	[28, 82]
Structural level barriers	Financial constraints	[23–28, 38, 40, 44, 45, 47, 48, 53–55, 58, 61, 64, 66, 67, 69, 76, 78, 80, 81, 86, 89]
	Work and household responsibilities	[28, 40, 45, 46, 48, 53, 56, 61]
	Food insecurity	[23–28, 38, 40, 41, 44, 46, 48, 51, 56, 59, 64, 68, 73, 81, 89]
	Institutional limitations	[24, 59, 60, 65, 68, 82, 89]
	Workforce and service delivery constraints	[41, 56, 59, 62, 68]
	Organizational issues	[75]
	Work and academic conflicts	[25–27, 80, 82]
	Geographic barriers	[25, 51, 67]
	Travel and mobility	[53, 60, 65, 66, 89]
	Clinic accessibility issues	[40, 45, 60, 61, 65, 74]
	Alternative medicine use	[24, 26, 28, 41, 48, 56, 64, 68, 70, 74, 76, 80]
	Cultural and religious beliefs	[28, 39, 45, 54, 55, 61, 64, 65, 69, 73, 74, 87]
	Language barriers	[41, 65, 73, 76, 82]
	Cultural practices	[58, 63, 69]
	Gender and relationship issues	[39, 44, 48, 49, 65, 68, 69, 85, 88]
	Social relationships	[28, 41, 50, 60, 69, 82]
Health system level barriers	Accessibility and infrastructure issues	[23, 25, 27, 37, 38, 44, 46–48, 51, 54, 56, 58–60, 65, 67–69, 73, 76, 78, 80, 81, 87]
	Health system inefficiencies	[23, 24, 26, 37, 38, 40, 44, 45, 51, 53, 55, 58, 59, 61, 65, 66, 68, 70, 72, 73, 75, 78–83, 88]
	Poor healthcare provider attitudes and relationships	[25, 40, 45, 48, 53, 55, 59, 61, 65, 68, 72, 73, 75, 76]
	Lack of art service delivery	[24, 28, 40, 44, 48, 51, 53, 55, 58, 59, 71, 73, 79, 81]
	Clinic visits and treatment adherence issues	[49, 59, 60, 71]
	Lack of treatment support	[28, 36, 49]
	Drug accessibility issues	[52, 59, 60]

routines [23, 24, 45, 55, 67, 69, 71, 72, 80, 87]. Religious and spiritual beliefs also provided emotional resilience and encouragement for adherence [58, 75]. In addition, practical strategies such as reminder systems, habitual routines, and familiarity with treatment regimens supported sustained medication use [25, 50, 59, 61, 72–74, 83]. Knowledge

and awareness of HIV and its treatment, alongside supportive communication and interpersonal relationships, further enhanced adherence, while demographic characteristics such as age and gender influenced adherence patterns [27, 30, 59, 64, 75, 83, 86].

3.13 Social-level facilitators

The review further demonstrates that social and interpersonal dynamics play a critical role in facilitating adherence. Family and peer support systems provided essential emotional, financial, and practical assistance, thereby improving patients' ability to remain engaged in care [23, 24, 26, 27, 44–47, 49, 55, 56, 59, 65, 69, 71, 74, 75, 84, 87]. Broader community support and social networks also contributed to adherence by fostering a sense of belonging and reducing isolation [23, 49, 75, 76, 79, 85]. Disclosure of HIV status and subsequent acceptance enabled access to support systems and reduced the psychological burden associated with secrecy [24, 30, 34, 38, 58, 68, 73, 80]. Furthermore, motivation from significant others, involvement of informal caregivers, and social integration reinforced adherence behaviours [24, 71, 82]. These findings highlight the importance of supportive social environments in sustaining long-term treatment engagement.

3.14 Structural-level facilitators

At the structural level, the review identifies several enabling factors related to environmental, economic, and policy conditions that enhance adherence. Proximity to health-care facilities and favourable environmental contexts facilitated regular clinic attendance and continuity of care [26, 58]. Flexible service hours and convenient facility locations further improved accessibility [81]. The consistent availability and accessibility of ART services were central to adherence, ensuring uninterrupted access to medication [23, 26, 28, 49, 55, 56, 59, 74–76, 79, 85]. Supportive health facility environments, alongside the presence of clear policies and treatment guidelines, contributed to improved adherence outcomes [26, 28, 76, 77]. Additionally, provision of nutritional and financial support addressed key socioeconomic barriers, enabling patients to prioritise treatment adherence [44, 56, 59, 72, 75].

3.15 Health system-level facilitators

The review also highlights the critical role of health system factors in promoting adherence through effective service delivery and patient-centred care. Reliable availability of ART and efficient healthcare systems enhanced continuity and quality of care [26, 28, 44, 75, 85]. Programmatic adaptations, including differentiated and flexible service delivery models, improved access and responsiveness to patient needs [23]. Strengthened healthcare infrastructure and well-organised services further supported treatment uptake and retention [45, 77]. Positive healthcare provider–patient relationships, characterised by trust, empathy, and effective communication, were consistently associated with improved adherence [27, 44, 55, 58, 71, 74, 87]. Moreover, adherence counselling, patient education, and tailored support strategies equipped individuals with the knowledge and skills necessary to sustain treatment routines [24, 25, 30, 33, 42, 46, 61, 74, 82]. Flexible scheduling, routine monitoring, and efficient medication distribution systems further ensured continuity of care and supported long-term adherence outcomes [51, 55, 58, 76, 91] (Table 5).

Table 5 Facilitators that enhance ART adherence

Main themes	Sub-themes	Authors
Individual-level facilitators	Improved health and prolonged life	[24–26, 69, 72, 73, 85]
	Trust in ART efficacy	[23, 27, 54, 56, 61]
	Perceived benefits of ART	[44, 45, 69–71, 73]
	Coping strategies	[23, 44, 65, 67]
	Motivations for adherence	[24, 25, 61, 69, 70, 78]
	Religious and spiritual factors	[28, 73]
	Communication and relationships	[85]
	Reminder systems	[25, 50, 61, 73, 74, 83]
	Routine and habits	[56]
	Familiarity with treatment	[70]
	Gender-related factors	[27, 30, 83]
	Age-related factors	[62]
	Knowledge and awareness	[56, 73]
Social level facilitators	Family and peer support	[23–27, 43–46, 54, 56, 61, 63, 67, 69, 72, 73, 82, 88]
	Community support	[23, 74, 77, 83]
	Social networks	[73, 88]
	Disclosure and acceptance	[24, 30, 34, 38, 58, 68, 73, 80]
	Motivation from others	[69]
	Informal caregivers	[80]
Structural level facilitators	Social integration	[24]
	Healthcare facility proximity	[26]
	Environmental influences	[28]
	Location and operational hours	[79]
	Availability and accessibility of ART services	[23, 26, 53, 54, 56, 61, 72–74, 77, 83, 88]
	Health facility environment	[26, 53, 74]
	Policy and guidelines	[26, 75]
Health system level facilitators	Nutritional and financial support	[43, 54, 56, 70, 73]
	Availability of ART	[26, 53, 73, 83]
	Healthcare efficiency	[26, 43]
	Programmatic adjustments	[23]
	Improved healthcare infrastructure	[44, 75]
	Support from healthcare providers	[25, 27, 28, 43, 61, 69, 72]
	Adherence counselling, strategies and education	[24, 25, 30, 33, 42, 46, 61, 74, 82]
	Scheduling flexibility	[28]
	Clinic visits and monitoring	[91]
	Medication collection and distribution	[50, 61, 74]

The analysis shows that facilitators of antiretroviral therapy adherence differ across study designs and population groups. Qualitative studies mainly emphasised psychosocial and relational enablers such as family and peer support, confidence in treatment effectiveness, positive interactions with healthcare providers, and perceived health improvements [24, 26, 56, 72]. In contrast, quantitative and cross-sectional studies more commonly identified observable factors, including healthcare access, adherence counselling, and economic support [28, 48, 50]. Evidence from cohort and longitudinal studies highlighted the enduring importance of structural elements such as continuity of care, decentralised service delivery, and reliable medication supply [23, 47, 64, 91]. Differences across population groups were also evident, with adolescents relying more on caregiver involvement, peer support, and organised adherence systems [44, 65, 84], whereas adults were more influenced by personal motivation, prior treatment experience, and economic stability [71, 80, 86]. Additional facilitators among pregnant women

and other vulnerable groups reflected the role of targeted interventions and integrated care approaches [18, 49].

4 Discussion

4.1 Summary of findings

This scoping review revealed substantial variation in ART adherence across Sub-Saharan Africa, with rates ranging from 25.07% in Kenya to 87.1% in Uganda, reflecting the influence of multiple personal, social, and systemic factors. Barriers included financial hardship, transport difficulties, food insecurity, long waiting times, drug stock-outs, staff shortages, stigma, fear of disclosure, depression, side effects, pill burden, and reliance on traditional medicine, all of which undermined treatment continuity. Conversely, adherence was strengthened by improved health outcomes, trust in ART effectiveness, fear of HIV progression, and strong social support from family, peers, communities, and healthcare providers. Additional facilitators included free or nearby ART services, flexible clinic hours, simplified regimens, and material assistance such as food and transport support, alongside religious and cultural practices that reinforced commitment. These findings highlight the complex interplay of barriers and facilitators shaping ART adherence and underscore the need for targeted interventions that address systemic challenges while building on supportive social and structural factors to improve treatment outcomes.

4.2 Level of adherence to ART

Adherence levels varied considerably across Sub-Saharan African countries, reflecting differences in healthcare infrastructure, treatment accessibility, socioeconomic conditions, and health system capacity. Similar disparities have been documented in earlier reviews, which attributed variation in adherence outcomes to structural inequities, healthcare accessibility challenges, and sociocultural influences [14, 16]. The lowest adherence levels were reported in Kenya (25.07%) and Ghana (42.9%) [43, 45], where financial hardship, geographical disparities, and weak medication distribution systems appear to undermine continuity of treatment. Intermediate adherence levels observed in Ethiopia (50.0%), Uganda (51%), and Zambia (59.9%) [37, 46, 47] may reflect gradual improvements in healthcare delivery and access to treatment services; however, persistent challenges, including transportation costs, affordability constraints, and inadequate follow-up systems, continue to compromise sustained adherence. In Ethiopia, patient education initiatives have not consistently translated into long-term adherence, while infrastructural deficiencies in remote regions remain significant barriers in Zambia.

Higher adherence levels reported in South Africa (65% and 69%) and Ghana (73%) [28–30] may reflect comparatively stronger healthcare systems, enhanced adherence support services, and broader investments in chronic disease management. South Africa's comparatively favourable outcomes may be associated with sustained investments in HIV care infrastructure and adherence monitoring systems, whereas improvements observed in Ghana may reflect the influence of awareness campaigns and policy reforms promoting medication adherence. The highest adherence levels were documented in Botswana (75.6%) and Uganda (87.1%) [23, 31], where free antiretroviral therapy services, decentralised healthcare delivery, and community-based support systems appear to facilitate sustained treatment engagement. Nevertheless, the substantial variability

in adherence across countries underscores persistent structural inequities, including inadequate healthcare financing, shortages of skilled health personnel, socioeconomic vulnerability, and sociocultural beliefs that continue to shape treatment perceptions and adherence behaviours across the region. Collectively, these findings reinforce earlier evidence demonstrating that antiretroviral therapy adherence is shaped by complex and interdependent interactions between individual motivation, social support systems, structural conditions, and healthcare delivery environments [9, 17].

Existing evidence indicates that barriers to antiretroviral therapy adherence rarely operate independently; rather, socioeconomic deprivation, food insecurity, transportation difficulties, and limited healthcare access frequently intensify psychosocial challenges such as stigma, emotional distress, fear of disclosure, and treatment fatigue [14, 16]. These interconnected influences collectively shape treatment behaviours and continuity of care across diverse settings in Sub-Saharan Africa. Previous reviews have examined determinants of adherence among adults [14, 91], adolescents and young people [15, 92], pregnant women [18] and intervention-related barriers and facilitators [14], while other syntheses have focused on theoretical mechanisms underpinning adherence interventions, particularly adherence club models [12]. However, much of the existing literature has concentrated on specific populations, intervention approaches, or isolated determinants of adherence rather than examining the dynamic interactions across ecological levels.

Although the Socio-Ecological Model appropriately captures the multidimensional nature of adherence, previous evidence syntheses have often presented determinants as discrete categories rather than interconnected processes operating across individual, interpersonal, structural, and health system domains [9, 14]. Structural conditions such as poverty and geographic inaccessibility may reinforce psychosocial barriers, including stigma and non-disclosure, which subsequently contribute to treatment interruption and poor adherence. In contrast, supportive health systems, decentralised services, and strong social support networks may mitigate the adverse effects of socioeconomic vulnerability and psychological distress. These interactions underscore adherence as a contextually embedded process shaped by complex and dynamic relationships across multiple levels of influence. Furthermore, although the inclusion of methodological quality appraisal strengthens the rigour of the evidence synthesis, stronger integration of appraisal findings into the interpretation of results would enhance transparency and analytical depth. Previous reviews have frequently been criticised for presenting findings without adequately considering the methodological robustness of the included studies [16, 17]. Differentiating findings derived predominantly from high-quality studies from those supported by studies with methodological limitations would therefore strengthen the credibility of the conclusions and improve understanding of the overall strength of the available evidence.

4.3 Barriers to ART adherence

The findings of this review indicate that barriers to antiretroviral therapy adherence are not isolated factors, but rather interconnected processes operating across individual, social, structural, and health system levels. In line with the Socio-Ecological Model, structural constraints such as poverty, transportation costs, food insecurity, and geographic inaccessibility frequently triggered psychosocial and behavioural challenges

that ultimately undermined adherence behaviour. For instance, financial hardship and food scarcity limited patients' ability to attend clinic appointments and take medication consistently, particularly where treatment was perceived to require adequate nutrition [23, 24, 49, 87]. Similarly, long travel distances, restrictive clinic schedules, and health system inefficiencies, including drug stock-outs and staff shortages, contributed to treatment fatigue, frustration, and disengagement from care [27, 28, 41, 42, 63, 68, 70, 75]. Among adolescents, inadequate school-based support systems and poor medication storage arrangements intensified fear of disclosure and non-adherence behaviours [63]. These findings demonstrate how structural and institutional deficiencies indirectly shape adherence through psychological stress, social vulnerability, and reduced treatment motivation.

The review further demonstrates that psychosocial barriers were deeply embedded within broader social and cultural contexts. Stigma, discrimination, and fear of disclosure consistently discouraged sustained engagement with treatment services, as individuals sought to avoid social rejection and unintended exposure of their HIV status [24, 26, 49]. In many settings, non-disclosure limited access to emotional and practical support, thereby reinforcing isolation and treatment discontinuation. Depression, anxiety, and emotional distress further weakened adherence motivation, particularly where patients experienced persistent socioeconomic hardship or poor healthcare interactions [44, 60]. Treatment-related burdens, including severe side effects and complex regimens, compounded these challenges and contributed to intentional non-adherence [27, 58, 75, 80]. Cultural and religious beliefs, including reliance on herbal remedies and traditional healers, also influenced perceptions of ART and weakened long-term treatment engagement [42, 70]. These interacting pathways illustrate that adherence outcomes are generated through cumulative influences across multiple ecological levels rather than through individual behaviour alone.

Compared with previous evidence syntheses, which have often focused on specific populations, single-country contexts, or isolated determinants of adherence [14–17], this review provides a broader integrative synthesis of barriers and facilitators across diverse Sub-Saharan African settings while explicitly applying the Socio-Ecological Model to interpret adherence dynamics. This approach advances existing evidence by demonstrating how structural and health system constraints generate downstream psychosocial and behavioural barriers that influence adherence outcomes. Furthermore, unlike many earlier reviews that examined barriers or facilitators separately, the present review synthesises both dimensions concurrently, thereby providing a more comprehensive understanding of how enabling and constraining factors interact within varying sociocultural and healthcare contexts.

The methodological appraisal further strengthens the interpretation of findings by demonstrating that the evidence base was predominantly of moderate-to-high quality. Higher-quality qualitative studies consistently highlighted stigma, disclosure challenges, and patient–provider relationships as central psychosocial determinants of adherence, while stronger quantitative and longitudinal studies more reliably demonstrated the persistent effects of structural barriers such as poverty, transport difficulties, and healthcare accessibility [23, 37, 47]. Nevertheless, some lower-quality studies showed limited control of confounding variables and weaker analytical rigour, suggesting that certain findings, particularly those relating to isolated behavioural determinants, should be

interpreted cautiously. Overall, the consistency of findings across higher-quality studies reinforces the reliability of the evidence and underscores that ART adherence in Sub-Saharan Africa is fundamentally shaped by interacting structural, social, psychological, and health system processes requiring integrated, population-sensitive, and system-responsive interventions.

4.4 Facilitators that enhance ART adherence

The findings of this review suggest that facilitators of antiretroviral therapy adherence operate through interconnected psychosocial, structural, and health system mechanisms rather than as isolated influences. Perceived improvements in health status and increased life expectancy emerged as major drivers of sustained adherence, as individuals who experienced physical recovery and reduced HIV-related complications were more likely to maintain treatment engagement [24, 26, 71, 74, 75, 86, 87]. Confidence in the effectiveness of antiretroviral therapy also strengthened long-term adherence, reinforcing patients' belief in treatment benefits and disease control [23, 27, 45, 46, 55, 56, 59, 71–73, 75]. At the interpersonal level, family support, peer encouragement, and broader community acceptance played critical roles in reducing stigma, facilitating disclosure, and promoting emotional resilience, all of which contributed positively to adherence behaviours [23, 24, 26, 27, 44–47, 49, 55, 56, 59, 65, 69, 71, 74, 75, 84, 87]. Several studies further indicated that disclosure to trusted individuals enhanced adherence through emotional reassurance, practical assistance, and shared accountability [72, 75]. Religious and spiritual beliefs also served as coping mechanisms that strengthened hope and sustained motivation for treatment continuation [58, 75].

The review additionally demonstrates that these psychosocial facilitators are closely linked to broader structural and health system conditions. Structural interventions such as free ART provision, decentralised medication distribution, outreach services, nutritional assistance, and transport support reduced the economic and logistical burdens commonly associated with treatment interruption [44, 56, 59, 72, 75, 76]. Improved accessibility through flexible clinic schedules, reduced travel distances, and weekend service delivery further enhanced continuity of care and reduced missed appointments [48, 81, 91]. These structural improvements appeared to indirectly reinforce psychosocial well-being because they reduced stress, improved patient satisfaction, and increased trust in healthcare systems. Supportive patient–provider relationships characterised by respectful communication, counselling, and regular follow-up also promoted adherence through strengthened patient confidence and sustained engagement with care [27, 44, 55, 58, 71, 74, 87]. Collectively, the evidence indicates that adherence outcomes are shaped through cumulative and mutually reinforcing pathways, where supportive health systems and favourable structural conditions enhance psychosocial resilience and sustained treatment engagement.

Compared with earlier evidence syntheses that primarily focused on specific populations or isolated determinants of adherence [14, 15, 17], this review provides a broader regional synthesis of both facilitators influencing ART adherence across Sub-Saharan Africa. The explicit application of the Socio-Ecological Model further extends previous studies by demonstrating how individual, interpersonal, structural, and health system factors interact dynamically to influence adherence behaviours. This integrative approach contributes to a more comprehensive understanding of the pathways through

which structural disadvantages shape psychosocial experiences and ultimately affect long-term adherence outcomes across diverse contexts.

The review also revealed variation in the strength and consistency of evidence according to study design and methodological quality. Higher-quality longitudinal and mixed-methods studies consistently identified continuity of care, decentralised service delivery, and strong patient–provider relationships as important determinants of sustained adherence [23, 47, 91]. In contrast, several lower-quality cross-sectional studies tended to emphasise immediate behavioural and demographic correlates without adequately accounting for broader structural influences. High-quality qualitative studies provided particularly strong evidence regarding the importance of stigma reduction, disclosure, and social support in promoting adherence [24, 26, 49, 72]. Overall, the findings underscore the importance of integrated, multi-level interventions that simultaneously strengthen healthcare systems, reduce structural vulnerabilities, and enhance psychosocial support mechanisms to sustain long-term adherence to HIV treatment in Sub-Saharan Africa.

4.5 Implication for policy, practice and research

The findings of this review demonstrate that socioeconomic constraints, health system inefficiencies, and geographical barriers remain dominant determinants of antiretroviral therapy adherence across Sub-Saharan Africa. In response, Ministries of Health, in collaboration with national HIV control programmes and development partners, should prioritise decentralisation of antiretroviral therapy services through community-based distribution models, mobile clinics, and differentiated service delivery approaches to reduce travel distance, waiting times, and service congestion. Given the recurrent reports of drug stock-outs and delayed service delivery, government agencies and donor organisations should strengthen supply chain management systems to ensure uninterrupted availability of antiretroviral medicines. Policies supporting task-shifting and formal integration of community health workers into adherence counselling and follow-up services are particularly important in rural and underserved settings, where shortages of skilled health personnel were frequently identified as barriers.

At the service delivery level, the review highlights the central role of healthcare facilities, clinicians, and community-based organisations in addressing psychosocial and behavioural barriers to adherence, including stigma, non-disclosure, and treatment fatigue. Healthcare providers should implement patient-centred care approaches, including routine adherence counselling, respectful provider–patient communication, and flexible appointment scheduling, which were consistently associated with improved adherence. Non-governmental organisations (NGOs) and civil society organisations should support peer-led adherence clubs, family-inclusive care models, and community support groups, which were shown to mitigate stigma and strengthen social support networks. In addition, partnerships with faith-based organisations and traditional leaders can facilitate culturally sensitive education and community acceptance, addressing sociocultural beliefs that influence treatment engagement.

The evidence mapped in this review indicates persistent gaps in understanding the long-term effectiveness of adherence interventions across diverse contexts. Research institutions and public health agencies should prioritise longitudinal and implementation-focused studies that evaluate differentiated service delivery models, multi-month

dispensing, and community-based medication pick-up points, which were frequently reported as facilitators of adherence. Further research is also needed to assess the effectiveness of digital health interventions, including short message service reminders, mobile health applications, and telemedicine follow-up, particularly among adolescents and mobile populations. National HIV programmes should integrate routine data monitoring, operational research, and adaptive learning frameworks to ensure that policy and practice remain responsive to evolving adherence challenges. Strengthened collaboration between governments, healthcare providers, and research organisations will be essential for translating evidence into scalable, equitable, and patient-centred adherence strategies aligned with global HIV treatment goals.

4.6 Limitations in this review

This review has several limitations that should be considered when interpreting the findings. Substantial heterogeneity existed in study designs and in the methods used to measure antiretroviral therapy adherence, with many studies relying on self-reported measures alongside pharmacy refill data and viral load suppression, which may have introduced measurement inconsistency and reporting bias and contributed to the wide variation in reported adherence levels. The predominance of cross-sectional and qualitative designs further limits the ability to assess changes in adherence over time and constrains causal interpretation of reported associations. In addition, the underrepresentation of adolescents and key populations, together with marked variation in geographical settings, health system capacity, and sociocultural contexts, restricts generalisability and cross-country comparability. Finally, restriction to English-language publications and reliance on published and accessible grey literature may have introduced publication bias, as studies reporting non-significant or negative findings are less likely to be disseminated, potentially influencing the overall synthesis.

5 Conclusion

This scoping review provides new knowledge by offering a comprehensive synthesis of multilevel health, social, economic, and structural factors influencing sustained antiretroviral therapy adherence across Sub-Saharan Africa, moving beyond fragmented, single-country evidence to demonstrate how adherence is shaped by the interaction of individual beliefs, social support systems, healthcare delivery conditions, and broader structural arrangements. The review shows that improved health status, trust in antiretroviral therapy efficacy, perceived treatment benefits, and supportive family, peer, and community networks consistently underpin continued engagement with treatment, alongside health system factors such as reliable medicine availability and supportive patient–provider relationships. However, important gaps remain, particularly regarding the effectiveness of identified facilitators, the causal pathways through which they operate, and their applicability across diverse sociocultural and health system contexts, as well as the limited availability of longitudinal and evaluative studies. These findings are highly relevant for practice, as they highlight the need for integrated, multi-level adherence strategies that combine strengthened healthcare delivery with community-based support, patient education, and targeted material assistance, thereby providing an evidence-informed foundation for policy, programme design, and future research aimed at improving long-term treatment adherence in Sub-Saharan Africa.

Abbreviations

AIDS	Acquired immune deficiency syndrome
ARV	Anti-retroviral agents
ART	Anti-retroviral therapy
cART	Combination antiretroviral therapy
HAART	Highly active antiretroviral therapy
HIV	Human immunodeficiency virus
MeSH	Medical subject headings
NGO	Non-governmental organisation
PLHIV	People living with HIV
PRISMA-ScR	Preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews
SSA	Sub-Saharan Africa

Supplementary Information

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Additional file 1.

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References

1. Joint United Nations Programme on HIV/AIDS. The path that ends AIDS: 2023 UNAIDS global AIDS update. 2023.
2. World Health Organization. HIV/AIDS. WHO Reg Off Africa; 2022.
3. Dimitri C. How South African women's HIV status impacts the obstetric care they receive. School of Public Heal Brown University. 2024.
4. Bijker R, Jiamsakul A, Kityo C, Kiertiburanakul S, Siwale M, Phanuphak P, et al. Adherence to antiretroviral therapy for HIV in sub-Saharan Africa and Asia: a comparative analysis of two regional cohorts. *J Int AIDS Soc*. 2017;20:21218. <https://doi.org/10.7448/IAS.20.1.21218>.
5. Magura J, Nhari SR, Nzimakwe TI. Barriers to ART adherence in sub-Saharan Africa: a scoping review toward achieving UNAIDS 95-95-95 targets. *Front Public Health*. 2025. <https://doi.org/10.3389/fpubh.2025.1609743>.
6. World Health Organisation. HIV drug resistance. World Heal Organ; 2022.
7. World Health Organization. The role of HIV viral suppression in improving individual health and reducing transmission: policy brief. World Health Organization; 2023.
8. Cohen M, Eshleman S, McCauley M, Chen Y. Antiretroviral therapy to prevent HIV acquisition: limits of estimation from a population cohort. *Clin Infect Dis*. 2016;63:1679–80.
9. Eshun-Wilson I, Rohwer A, Hendricks L, Oliver S, Garner P. Being HIV positive and staying on antiretroviral therapy in Africa: a qualitative systematic review and theoretical model. *PLoS ONE*. 2019;14:e0210408.
10. Barak T, Neo DT, Tapela N, Mophuthegi P, Zash R, Kalenga K, et al. HIV-associated morbidity and mortality in a setting of high ART coverage: prospective surveillance results from a district hospital in Botswana. *J Int AIDS Soc*. 2019;22:e25428.
11. Rwanda Biomedical Centre. Rwanda National HIV Annual Report. 2016;1–103.
12. Mukumbang FC, Van Belle S, Marchal B, van Wyk B. Exploring 'generative mechanisms' of the antiretroviral adherence club intervention using the realist approach: a scoping review of research-based antiretroviral treatment adherence theories. *BMC Public Health*. 2017;17:385. <https://doi.org/10.1186/s12889-017-4322-8>.

13. Glick JL, Huang A, Russo R, Jivapong B, Ramasamy V, Rosman L, et al. ART uptake and adherence among women who use drugs globally: a scoping review. *Drug Alcohol Depend.* 2020;215:108218. <https://doi.org/10.1016/j.drugalcdep.2020.108218>.
14. Buh A, Deonandan R, Gomes J, Krentel A, Oladimeji O, Yaya S. Barriers and facilitators for interventions to improve ART adherence in sub-Saharan African countries: a systematic review and meta-analysis. *PLoS ONE.* 2023;18:e0295046.
15. Moyo E, Moyo P, Mangwana H, Murewanhema G, Dzinamarira T. Facilitators and barriers to antiretroviral therapy adherence among adolescents and young adults in sub-Saharan Africa: a scoping review. *Adolescents.* 2025;5:10.
16. Heestermans T, Browne JL, Aitken SC, Vervoort SC, Klipstein-Grobusch K. Determinants of adherence to antiretroviral therapy among HIV-positive adults in sub-Saharan Africa: a systematic review. *BMJ Glob Heal.* 2016;1:e000125. <https://doi.org/10.1136/bmjgh-2016-000125>.
17. Hlophe LD, Tamuzi JL, Shumba CS, Nyasulu PS. Barriers and facilitators to anti-retroviral therapy adherence among adolescents aged 10 to 19 years living with HIV in sub-Saharan Africa: a mixed-methods systematic review and meta-analysis. *PLoS ONE.* 2023;18:e0276411.
18. Omonaiye O, Kusljic S, Nicholson P, Manias E. Medication adherence in pregnant women with human immunodeficiency virus receiving antiretroviral therapy in sub-Saharan Africa: a systematic review. *BMC Public Health.* 2018;18:1–20.
19. Velloza J, Kemp CG, Aunon FM, Ramaiya MK, Creegan E, Simoni JM. Alcohol use and antiretroviral therapy non-adherence among adults living with HIV/AIDS in sub-Saharan Africa: a systematic review and meta-analysis. *AIDS Behav.* 2020;24:1727–42.
20. Govindasamy D, Ford N, Kranzer K. Risk factors, barriers and facilitators for linkage to antiretroviral therapy care: a systematic review. *AIDS.* 2012;26:2059–67.
21. Leahy A, Ferri D. Barriers and facilitators to cultural participation by people with disabilities: a narrative literature review. *Scand J Disabil Res.* 2022;24:68–81.
22. Polden M, Readman MR, Barnard T, Godfrey A, Gray A, Giebel C. Barriers and facilitators to accessing and engaging with arts-based non-pharmacological interventions for people living with dementia: a systematic review. *Dementia Lond.* 2026;25:861–82.
23. Roura M, Busza J, Wringe A et al. Barriers to sustaining antiretroviral treatment in Kisesa, Tanzania: a follow-up study to understand attrition from the antiretroviral program. 2009;23.
24. Patel RC, Odoyo J, Anand K, Stanford-moore G, Wakhungu I, Bukusi EA, et al. Facilitators and barriers of antiretroviral therapy initiation among HIV discordant couples in Kenya: qualitative insights from a pre-exposure prophylaxis implementation study. *PLoS ONE.* 2016. <https://doi.org/10.1371/journal.pone.0168057>.
25. Dirisu O, Eluwa GIE, Callens S, Adams E, Akinwunmi A, Geibel S, et al. 'I take the drugs... to make the sickness to move out of me': key populations' and service provider perspectives about facilitators and barriers to ART adherence and retention in care in Nigeria. *Arch Public Heal.* 2024;82:1–13. <https://doi.org/10.1186/s13690-024-01282-9>.
26. Hlongwa M, Jama NA, Mehlomakulu V, Pass D, Basera W, Nicol E. Barriers and facilitating factors to HIV treatment among men in a high-HIV-Burdened district in KwaZulu-Natal South Africa: a qualitative study. *Am J Men's Health.* 2022. <https://doi.org/10.1177/15579883221120987>.
27. Sato M, Giorgis BW, Malley GO. Barriers to and factors facilitating adherence to antiretroviral therapy from the perspectives of patients in Mäqälä city, T3gray region, Ethiopia. *Nilo-Ethio Stud.* 2016;28:15–28.
28. Buh A, Deonandan R, Gomes J, Krentel A, Oladimeji O, Yaya S. Barriers and facilitators to ART adherence among ART non-adherence people living with HIV in Cameroon: a qualitative phenomenological study. *PLoS ONE.* 2023;18:e0291487. <https://doi.org/10.1371/journal.pone.0291487>.
29. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol.* 2005;8:19–32.
30. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med.* 2018;169:467–73.
31. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci.* 2010;5:1–9.
32. Aromataris E, Stern C, Lockwood C, Barker TH, Klugar M, Jadotte Y, et al. JBI series paper 2: tailored evidence synthesis approaches are required to answer diverse questions: a pragmatic evidence synthesis toolkit from JBI. *J Clin Epidemiol.* 2022;150:196–202. <https://doi.org/10.1016/j.jclinepi.2022.04.006>.
33. Doe PF, Alhassan A, Otchere BA, Odonkor FO, Erzuah IA, Mintah YD, et al. Factors influencing preconception care awareness and knowledge among women in Africa: a systematic review. *Front Reprod Heal.* 2025;7:1702378. <https://doi.org/10.3389/frph.2025.1702378>.
34. Amoada M, Ansah EW, Assopiah P, Acquah P, Ansah JE, Berchie E, et al. Socio-cultural factors influencing adolescent pregnancy in Ghana: a scoping review. *BMC Pregnancy Childbirth.* 2022;22:834. <https://doi.org/10.1186/s12884-022-05172-2>.
35. Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The mixed methods appraisal tool (MMAT) version 2018 for information professionals and researchers. *Educ Inf.* 2018;34:285–91.
36. Mayanja BN, Kabunga E, Masiira B, Lubega R, Kaleebu P, Seeley J. Personal barriers to antiretroviral therapy adherence: case studies from a rural Uganda prospective clinical cohort. *Afr Health Sci.* 2013;13:311–9.
37. Okoye UO, Diekedie A, Afemikhe OA. Perceived barriers to accessing and adhering to antiretroviral therapy by people living with HIV/AIDS (PLWHAs) in Akwa Ibom State, Nigeria. *Res Humanit Soc Sci.* 2015;5:224.
38. Jonathan A. Socio-economic and institutional challenges experienced by patients receiving anti-retroviral treatment at Kiryandongo general hospital. 2019.
39. Buyu DW, Miruka CO, Maniga JN, Onchwari AN. Factors affecting adherence to anti-retroviral therapy at Kampala international university teaching hospital. 2016;4:17–22. <https://doi.org/10.12691/ajmsm-4-1-4>.
40. Kheswa JG. Exploring the factors and effects of non-adherence to antiretroviral treatment by people living with HIV AIDS. 2017;105–15.
41. Coetzee B, Kagee A, Bland R. Barriers and facilitators to paediatric adherence to antiretroviral therapy in rural South Africa: a multi-stakeholder perspective. *AIDS Care.* 2015;27:315–21. <https://doi.org/10.1080/09540121.2014.967658>.
42. Ondiek FA, Angira C, Nguka GO, Adoka SO. Determinants of adherence to anti-retroviral therapy among discordant couples in Uisgu division, Bondo sub-county, Kenya. *East Afr Med J.* 2018;95:1796–808.
43. Nabukeera-Barungi N, Elyanu P, Asire B, Katureebe C, Lukabwe I, Namusoke E, et al. Adherence to antiretroviral therapy and retention in care for adolescents living with HIV from 10 districts in Uganda. *BMC Infect Dis.* 2015;15:520. <https://doi.org/10.1186/s12879-015-1265-5>.

44. Sefah IA, Mensah F, Kurdi A, Godman B. Barriers and facilitators of adherence to antiretroviral treatment at a public health facility in Ghana: a mixed method study. *Hosp Pract*. 2022;50:110–7.
45. Curioso WH, Kepka D, Cabello R, Segura P, Kurth AE. Understanding the facilitators and barriers of antiretroviral adherence in Peru: a qualitative study. *BMC Public Health*. 2010;10:13.
46. Sasaki Y, Kakimoto K, Dube C, Sikazwe I, Moyo C, Syakantu G, et al. Adherence to antiretroviral therapy (ART) during the early months of treatment in rural Zambia: influence of demographic characteristics and social surroundings of patients. *Ann Clin Microbiol Antimicrob*. 2012;11:1–11.
47. Nhlolongwane N, Shonisani T. Predictors and barriers associated with non-adherence to ART by people living with HIV and AIDS in a selected local municipality of Limpopo province, South Africa. *Open AIDS J*. 2024;17:1–8. <https://doi.org/10.2174/18746136-v17-230726-2023-2>.
48. Adeniyi OV, Ajayi AI, Ter Goon D, Owolabi EO, Eboh A, Lambert J. Factors affecting adherence to antiretroviral therapy among pregnant women in the Eastern Cape, South Africa. *BMC Infect Dis*. 2018;18:1–11.
49. Prah J, Hayfron-Benjamin A, Abdulai M, Lasim O, Nartey Y, Obiri-Yeboah D. Factors affecting adherence to antiretroviral therapy among HIV/AIDS patients in Cape Coast Metropolis, Ghana. *J HIV AIDS*. 2018;4(1):10. <https://doi.org/10.16966/2380-5536.149>.
50. Ndiaye M. A study on the barriers to antiretroviral therapy adherence among human immunodeficiency virus infected adolescents in Gaborone (Botswana). 2014.
51. Nozipho B. Multi-level barriers to ART adherence among HIV-infected women in rural Eswatini: a mixed methods approach. 2019.
52. Barnett W. Barriers to adherence in patients failing second-line antiretroviral treatment in a township in South Africa: a qualitative research study. 2012.
53. Maduka O, Tobin-West CI. Barriers to HIV treatment adherence: perspectives from the nonadherent at a treatment center in South-South, Nigeria. *Ann Afr Med*. 2015;14:159–60. <https://doi.org/10.4103/1596-3519.149879>.
54. Tomori C, Kennedy CE, Brahmabhatt H, Wagman JA, Mbwanbo JK, Likindikoki S, et al. Barriers and facilitators of retention in HIV care and treatment services in Iringa, Tanzania: the importance of socioeconomic and sociocultural factors. *AIDS Care*. 2014;26:907–13. <https://doi.org/10.1080/09540121.2013.861574>.
55. Azia IN, Mukumbang FC, Van Wyk B. Barriers to adherence to antiretroviral treatment in a regional hospital in Vredenburg, Western Cape, South Africa. *South Afr J HIV Med*. 2016;17:1–8.
56. Sisa C. Identifying the potential barriers and facilitators that can contribute to the level of antiretroviral treatment adherence among people living with HIV and AIDS in the rural district of Chongwe, Zambia. 2010.
57. Altamirano J, Odero IA, Omollo M, Awuonda E, Ondeng K, Kang JL et al. Understanding ART adherence among adolescent girls and young women in Western Kenya: a cross-sectional study of barriers and facilitators. 2023.
58. Becker N, Cordeiro LS, Poudel KC, Sibiya TE, Sayer AG, Sibeko LN. Individual, household, and community level barriers to ART adherence among women in rural Eswatini. *PLoS ONE*. 2020;15:e0231952.
59. Inzaule SC, Hamers RL, Kityo C, De Wit TFR, Roura M. Long-term antiretroviral treatment adherence in HIV-infected adolescents and adults in Uganda: a qualitative study. *PLoS ONE*. 2016. <https://doi.org/10.1371/journal.pone.0167492>.
60. Onyango MA, Chergui H, Sabin LL, Messersmith LJ, Sarkisova N, Oyombra J, et al. School-level barriers of antiretroviral therapy adherence and interventions to overcome them among adolescents living with HIV in Western Kenya: a qualitative study abstract. *Open AIDS J*. 2021;15:93–107. <https://doi.org/10.2174/1874613602115010093>.
61. Demissie AA, van Rensburg EJ. Highly active antiretroviral therapy adherence among HIV-POSITIVE women in Southern Ethiopia. *Front Pharmacol*. 2024;15:1–44. <https://doi.org/10.3389/fphar.2024.1420979>.
62. George S, McGrath N. Social support, disclosure and stigma and the association with non-adherence in the six months after antiretroviral therapy initiation among a cohort of HIV-positive adults in rural KwaZulu-Natal, South Africa. *AIDS Care*. 2019. <https://doi.org/10.1080/09540121.2018.1549720>.
63. Nefungo E. An exploratory study of perceived barriers to antiretroviral therapy adherence amongst adolescents in Omuthiya district, Namibia. 2024.
64. Moomba K, Wyk B Van, Sciences H. Social and economic barriers to adherence among patients at Livingstone general hospital in Zambia. 2019;1–6.
65. Yunusa R. Barriers and facilitators to care-seeking among pregnant and postnatal HIV positive women in rural north Western Nigeria. 2019.
66. Ajuna N, Tumusiime B, Amanya J, Awori S, Rukundo GZ, Asimwe JB. Social networks and barriers to ART adherence among young adults (18–24 years) living with HIV at selected primary health facilities of Southwestern Uganda: a qualitative study. *HIV AIDS Res Palliat Care*. 2021;13:939–58. <https://doi.org/10.2147/HIV.S328643>.
67. Skovdal M, Campbell C, Madanhire C, Nyamukapa C, Gregson S. Challenges faced by elderly guardians in sustaining the adherence to antiretroviral therapy in HIV-infected children in Zimbabwe. *AIDS Care*. 2011;23:957–64. <https://doi.org/10.1080/09540121.2010.542298>.
68. Tafuma TA, Mahachi N, Dziwa C, Moga T, Baloyi P, Muyambo G, et al. Barriers to HIV service utilisation by people living with HIV in two provinces of Zimbabwe: results from 2016 baseline assessment. *South Afr J HIV Med*. 2018;19:1–6. <https://doi.org/10.4102/SAJHIVMED.V19I1.721>.
69. Ziblim AM, Inusah AHS, Boah M. Perceptions of patients and healthcare providers regarding barriers and enablers of HIV anti-retroviral therapy among women at a regional hospital in Ghana: implications for national HIV/AIDS control. *BMC Womens Health*. 2024. <https://doi.org/10.1186/s12905-024-03312-8>.
70. Dzansi G, Id ET, Chipps J. Promoters and inhibitors of treatment adherence among HIV/AIDS patients receiving antiretroviral therapy in Ghana: narratives from an underserved population. *PLoS ONE*. 2020;15:1–13. <https://doi.org/10.1371/journal.pone.0230159>.
71. Hanass-Hancock J, Bond V, Solomon P, Cameron C, Maimbolwa M, Menon A, et al. Perspectives on ART adherence among Zambian adults living with HIV: insights raised using HIV-related disability frameworks. *AIDS Care*. 2020;32:623–9.
72. Jjumba I, Kanyesigye M, Ndagijimana G, Wattira J, Olong C, Olok RA, et al. Perceived barriers and facilitators to antiretroviral therapy adherence among youth aged 15–24 years at a regional HIV clinic in SouthWestern Uganda: a qualitative study. *Afr Health Sci*. 2022;22:55.
73. Sanjobo N. Adherence to antiretroviral treatment in Zambia: a qualitative study of patients and health professionals' views. *Nawa Sanjobo Superv*. 2007;1–100.

74. Iwuji C, Chimukuche RS, Zuma T, Plazy M, Id JL, Orne-gliemann J et al. Test but not treat: community members' experiences with barriers and facilitators to universal antiretroviral therapy uptake in rural. 2020;1–14. <https://doi.org/10.1371/journal.pone.0239513>.
75. Makhado L, Davhana-Maselesele M, Farley JE. Barriers to tuberculosis and human immunodeficiency virus treatment guidelines adherence among nurses initiating and managing anti-retroviral therapy in KwaZulu-Natal and North West provinces. *Curationis*. 2018;41:1–8.
76. Groh K, Audet CM, Baptista A, Sidat M, Vergara A, Vermund SH et al. Barriers to antiretroviral therapy adherence in rural Mozambique. 2011.
77. Campbell C, Skovdal M, Mupambireyi Z, Madanhire C, Nyamukapa C, Gregson S. Health & place building adherence-competent communities: factors promoting children's adherence to anti-retroviral HIV/AIDS treatment in rural Zimbabwe. *Health Place*. 2012;18:123–31. <https://doi.org/10.1016/j.healthplace.2011.07.008>.
78. Ankomah A, Ganle JK, Lartey MY, Kwara A, Nortey PA, Perry M, et al. ART access-related barriers faced by HIV-positive persons linked to care in southern Ghana: a mixed method study. *BMC Infect Dis*. 2016. <https://doi.org/10.1186/s12879-016-2075-0>.
79. Kiyingi M, Nankabirwa JL, Wiltshire CS, Nangendo J, Kiweewa JM, Katahoire AR, et al. Perspectives of people living with HIV on barriers to timely ART initiation following referral for antiretroviral therapy: a qualitative study at an urban HIV clinic in Kampala, Uganda. *PLoS Glob Public Health*. 2023;3:e0001483.
80. Lahai M, Theobald S, Wurie HR, Lakoh S, Erah PO, Samai M, et al. Factors influencing adherence to antiretroviral therapy from the experience of people living with HIV and their healthcare providers in Sierra Leone: a qualitative study. *BMC Health Serv Res*. 2022. <https://doi.org/10.1186/s12913-022-08606-x>.
81. Nevondwe S. Non-adherence to antiretroviral treatment in Maquassi Hills, North West province: a social work perspective. 2017.
82. van Wyk BE, Davids LAC. Challenges to HIV treatment adherence amongst adolescents in a low socio-economic setting in Cape Town. *South Afr J HIV Med*. 2019;20:1–7. <https://doi.org/10.4102/sajhivmed.v20i1.1002>.
83. Machumu N, Frumence G, Anaeli A. Facilitators and barriers to optimum uptake of multimonth dispensing of antiretroviral treatment in Morogoro, Tanzania: a qualitative study. *BMJ Open*. 2024. <https://doi.org/10.1136/bmjopen-2023-080434>.
84. Atsehe PA, Tachin R, Iorlunmun F, Agbecha B Ben, Kwaghgah AT. Status denial and stigmatization on adherence to anti-retroviral therapy among HIV positive adolescents in Benue state. 2024;10–33.
85. Belus JM, Msimango LI, van Heerden A, Magidson JF, Bradley VD, Mdakane Y, et al. Barriers, facilitators, and strategies to improve participation of a couple-based intervention to address women's antiretroviral therapy adherence in KwaZulu-Natal. *South Afr Int J Behav Med*. 2024;31:75–84. <https://doi.org/10.1007/s12529-023-10160-7>.
86. Balcha TT, Jeppsson A, Bekele A. Barriers to antiretroviral treatment in Ethiopia: a qualitative study. 2011. <https://doi.org/10.1177/1545109710387674>.
87. Nortey AN, Dowou RK, Adjoda A, Alhassan A. Accessing antiretroviral therapy: qualitative study of patients experiences, compliance and barriers in the Ho teaching hospital, Ghana. *J Global Health Sci*. 2024;6:1–12.
88. Phiri K, McBride K, Moucheraud C, Mphande M, Balakasi K, Lungu E, et al. Community and health system factors associated with antiretroviral therapy initiation among men and women in Malawi: a mixed methods study exploring gender-specific barriers to care. *Int Health*. 2021. <https://doi.org/10.1093/inthealth/ihaa041>.
89. Moucheraud C, Stern AF, Ahearn C, Ismail A, Nsubuga-Nyombi T, Ngonyani MM, et al. Barriers to HIV treatment adherence: a qualitative study of discrepancies between perceptions of patients and health providers in Tanzania and Uganda. *AIDS Patient Care STDS*. 2019;33:406–13. <https://doi.org/10.1089/apc.2019.0053>.
90. Achieng L, Musangi H, Ong S, Ombegoh E, Bryant L, Smith N, et al. An observational cohort comparison of facilitators of retention in care and adherence to anti-eetroviral therapy at an HIV treatment center in Kenya. *PLoS ONE*. 2012;7:1–7. <https://doi.org/10.1371/journal.pone.0032727>.
91. Campbell L, Masquillier C, Thunnissen E, Ariyo E, Tabana H, Sematlane N, et al. Social and structural determinants of household support for ART adherence in low- and middle-income countries: a systematic review. *Int J Environ Res Public Health*. 2020. <https://doi.org/10.3390/ijerph17113808>.
92. Hudelson C, Cluver L. Factors associated with adherence to antiretroviral therapy among adolescents living with HIV/AIDS in low-and middle-income countries: a systematic review. *AIDS Care*. 2015;27:805–16.

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