

# Global Level of Adherence to Antiretroviral Treatment for Human Immunodeficiency Virus Infection in the World Health Organization's Test and Treat Era in West Africa: A Systematic Review and Meta-Analysis

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## Abstract

**Background:** In West Africa, where the WHO “test and treat” policy has been implemented since 2016, evidence on adherence levels remains limited. **Objectives:** To systematically assess adherence to ART among people living with HIV. **Methods:** We conducted a systematic review and meta-analysis in accordance with PRISMA 2020 guidelines. We searched PubMed, Scopus, Web of Science, and Google Scholar for studies published between January 2016 and December 2023. Eligible studies reported adherence rates to ART among populations in West Africa after implementation of the test and treat strategy. We did not specify standardized measurement tools for measuring adherence. All measurement methods were taken into account. Study selection and data extraction were performed in duplicate. Pooled adherence proportions were estimated using a random-effects model. Publication bias was assessed with funnel plots and Egger's test. **Results:** Of 385 records screened, seven studies from Nigeria (3), Ghana (2), Sierra Leone (1), and Burkina Faso (1) were included, comprising 4436 participants. Adherence definitions varied (self-report, caregiver report, medical records). The pooled adherence rate was 63% (95% CI 45% - 79%). Adults' ad-



herence was 78%, 95% CI 66% - 88% compared with children, 23%, 95% CI 0% - 71%. Funnel plot inspection and Egger's test suggested possible publication bias. **Conclusions:** Adherence to ART in West Africa remains below optimal levels. Context-adapted interventions are urgently needed.

## Keywords

Adherence, Antiretroviral, HIV, West Africa

## 1. Introduction

The World Health Organization (WHO), through its “test and treat” strategy, has recommended treating anyone tested positive for HIV (human immunodeficiency virus) regardless of the clinical stage or CD4 count, since 2016 [1]. With the goal of ending HIV by 2030, WHO, the Global Fund, and UNAIDS have all aligned their global HIV strategies with Sustainable Development Goals (SDGs) target 3.3, aiming to end the HIV epidemic by 2030. In 2023, 86% [73% - 98%] of HIV-PVs knew their status, 77% [61% - 89%] were receiving antiretroviral therapy and 72% [65% - 80%] had achieved viral suppression [2].

The therapeutic success defined by viral load suppression depends on several factors, including adherence to treatment, which is one of the major pillars. Not only does adherence to treatment contribute to an undetectable viral load, but it also prevents the development of molecularly resistant strains of virus [3]. Several determinants, including non-adherence to medications could constitute a brake on viral load neutralization. This non-adherence is itself linked to several factors, notably related to medications, patients, health structures, or the community.

According to the World Health Organization (WHO), poor adherence to long-term treatments is a growing problem, with about 50% of patients with chronic diseases in developed countries not adhering to their treatment [4]. The issue of adherence to ARV treatment remains a challenge in the African context. Rates below the optimal rate (level of adherence of at least 95% to suppress the viral load according to the WHO) have already been described by several authors, notably in Cameroon (65.2%), Ghana (73%) and Nigeria (80.6%) [5]-[8].

Several interventions aimed at improving adherence to antiretroviral medications have been implemented [9].

The WHO test and treat policy has helped to increase the number of people living with HIV accessing antiretroviral treatment. The number of people with access on antiretroviral therapy was 7.7 million in 2010 [2], 17 million in 2016 [10] and 30.7 million in 2023 [2].

Since the implementation of this policy, there has been limited availability of data on overall adherence to antiretroviral treatment in West Africa.

The objective of our study was to make an inventory, through a systematic review meta-analysis, of the level of adherence to ARV medications in West Africa in the test and treat era. This meta-analysis aims to synthesize the available data on ARV

adherence in West Africa following the PRISMA guidelines.

## 2. Methods

### 2.1. Eligibility Criteria

We used the PICOTS criteria (population, intervention, comparator, outcomes (results), temporality, setting of intervention) to select our articles. In relation to the PICO, our population was made up of patients living with HIV, the intervention was antiretroviral (ARV) treatment, the result was adherence to antiretroviral therapy and the intervention environment was West Africa. We have given priority to single-proportion studies, so no comparator has been defined. The studies were taken into account if they included the following information: articles published between 1 January 2016 and 31 December 2023 and whose study topics were selected from the implementation of the ‘test and treat’ strategy of the WHO after June 2016 under antiretroviral treatment, residing in West Africa and in whom adherence to treatment with ARV drugs was measured. We did not specify standardized measurement tools for measuring adherence. All measurement methods were taken into account. Articles published in 2016 and after, if the topics were selected before 2016, were excluded from the study. Qualitative studies, as well as studies that did not estimate the rate of adherence, were also excluded from the study. Literature reviews, systematic reviews, meta-analyses were also excluded from our study.

### 2.2. Sources of Information

We have mainly searched the online bibliographic databases for article selection. The bibliographic databases used were PubMed, Scopus, Web of Science, Google Scholar. Last search: 15 January 2025. The Reference lists of included studies were screened. Grey literature was excluded.

### 2.3. Research Strategy

The writing of this systematic review and meta-analysis followed the standards of the PRISMA Guide (Preferred reporting items for systematic reviews and meta-analyses). The search equation was formulated by combining MeSH keywords using the Boolean operators OR and AND. The following search query has been formulated:

(“HIV” OR “acquired immune deficiency syndrome virus” OR “acquired immunodeficiency syndrome virus” OR “aids virus”) AND (“medication adherence” OR “Drug Adherence” OR “medication compliance” OR “drug compliance” OR “medication persistence”) OR (“patient compliance” OR “client compliance” OR “user compliance” OR “patient adherence” OR “client adherence” OR “patient cooperation” OR “therapeutic compliance” OR “treatment compliance”)) AND (“Treatment Adherence and Compliance” OR “Therapeutic Adherence and Compliance” OR “treatment adherence”) AND (“highly active antiretroviral therapy” OR “HAART” OR “Combination Antiretroviral Therapies” OR “Anti-retroviral agents” OR “ARV” OR “antiretrovirals”) AND (“West Africa” OR “Western Africa” OR “Benin” OR “Burkina Faso” OR “Cabo Verde” OR “Cote d’Ivoire” OR “Ivory Coast”

OR “Gambia” OR “Guinea-Bissau” OR “Liberia” OR “Mali” OR “Mauritania” OR “Niger” OR “Nigeria” OR “Senegal” OR “Sierra Leone” OR “Togo”).

#### **2.4. Selection Process**

Three reviewers independently screened titles, abstracts, and full texts using Abstrackr. Disagreements were resolved by consensus or by a fourth reviewer.

#### **2.5. Data Collection Process**

The first step consisted of selecting the articles by title, then by summary, then the articles were exported to Excel. Once on Excel we proceeded to remove duplicates from the titles. After removing the duplicates, we proceeded with another selection by reading the full texts. The selection of articles is presented in the form of a flow chart.

#### **2.6. Data Items**

The data extraction was performed according to PICOTS. The study population concerned patients living with HIV, the main measure was the proportion of adherence between 2018 and 2023. The variables collected concerned the authors, the date of publication, the year, the type of study, the design, the population studied, the number of subjects in the study, the proportion of observant patients, and the country in which the study was conducted. The methods for calculating adherence were not taken into account; instead, we considered the estimated adherence proportions reported in the studies.

#### **2.7. Study Risk of Bias Assessment**

The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) assessment grid was used to evaluate checks related to subject selection, confusion, follow-up, and adherence measurement method.

#### **2.8. Effect Measures**

Primary outcome: ART adherence rate with 95% confidence intervals.

#### **2.9. Synthesis Methods**

We conducted a meta-analysis of proportions following the PRISMA 2020 recommendations. The proportions extracted from each included study were combined to estimate an overall proportion with its 95% confidence interval. We used the software [11]. Given the bounded nature of the proportions (between 0 and 1), a stabilized variance transformation (logit type or double Freeman-Tukey arcsine) was applied in order to reduce the heterogeneous variance between studies. The overall estimate was then reconverted to the original scale for interpretation. A random-effects model was used (DerSimonian and Laird model) to account for inter-study heterogeneity. This model assumes that the proportions vary not only due to sampling error, but also due to actual differences between studies. Heterogeneity was

assessed using the  $I^2$  index and the Cochran Q test. One  $I^2 > 50\%$  was considered moderate heterogeneity to be elevated. An exploration of sources of heterogeneity was carried out by subgroup analyses. The results were synthesized using forest plots, indicating individual proportions, confidence intervals, and weight of each study in the analysis. Publication bias was assessed using funnel plots.

### 2.10. Reporting Bias Assessment

Funnel plots and Egger's test used.

### 2.11. Certainty Assessment

GRADE framework applied to overall and subgroup findings.

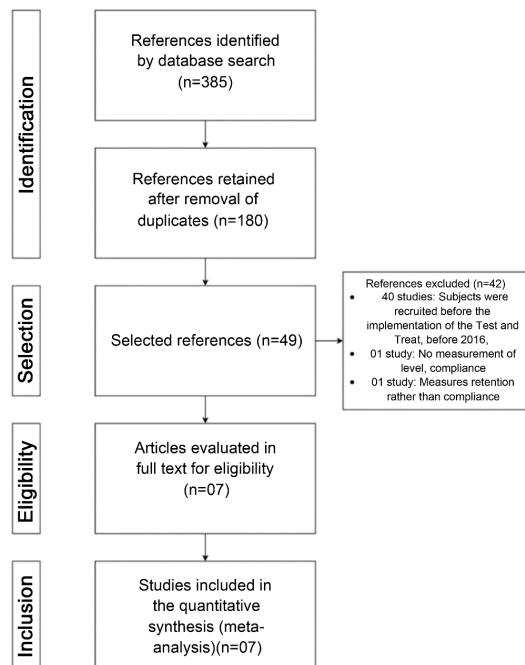
### 2.12. Registration

PROSPERO: CRD420251008258.

## 3. Results

### 3.1. Study Selection

Seven studies were included in this review following the selection process. **Figure 1** shows the flow diagram of study selection.



**Figure 1.** Flow diagram for the identification and selection of articles included in this review.

### 3.2. Study Characteristics

The adherence research included two studies involving children and five involving adults, **Table 1** presents the characteristics of the different studies selected for analysis.

**Table 1.** Characteristics of articles included in the systematic review on adherence to antiretroviral treatment in West Africa.

Study (year)	Country	Study objective	Study design	Study population	Sample size (n)	Adherence assessment method	Proportion with good adherence	Main determinants of non-adherence	Key conclusion
Biney <i>et al.</i> , 2021	Ghana	To assess ART adherence and viral suppression among young people	Cross-sectional	Adolescents and young adults living with HIV	136	Self-reported adherence	78.7%	Forgetfulness	Increased adherence support is required
Chime <i>et al.</i> , 2019	Nigeria	To analyze predictors of ART adherence and retention in care	Cross-sectional	Adults living with HIV	840	Medical record review (appointments, ART refills)	89.5%	Limited family support; distance to health facilities	Interventions targeting social and geographic barriers are needed
Eribo <i>et al.</i> , 2020	Nigeria	To assess self-reported ART adherence	Cross-sectional	Adults living with HIV	425	Patient self-report via questionnaire	83.3%	Workload; forgetfulness	Adherence awareness and counseling are necessary
Isika <i>et al.</i> , 2022	Nigeria	To identify factors associated with ART adherence	Cross-sectional	Adults living with HIV	999	Standardized self-administered questionnaire	60.1%	Education level; stigma; treatment-related costs	Economic and educational support is required
Lahai <i>et al.</i> , 2020	Sierra Leone	To assess quality of life and ART adherence among children	Cross-sectional	Children living with HIV	188	Caregiver report (observation and questionnaires)	5.9%	Socioeconomic constraints	Strong caregiver support is essential
Nichols <i>et al.</i> , 2019	Ghana	To assess ART adherence among children unaware of their HIV status	Cross-sectional	Children living with HIV	401	Indirect observation and adapted questionnaires	47.5%	Non-disclosure of HIV status	Disclosure may improve adherence
Zoungrana-Yameogo <i>et al.</i> , 2022	Burkina Faso	To identify adherence-related factors by gender and pregnancy status	Secondary analysis of national data	Pregnant/breastfeeding women, men, non-pregnant women	1,447	National monitoring data (appointments, ART refills)	74.0%	Variability across population groups	Tailored adherence strategies are required

### 3.3. Risk of Bias in Studies

The assessment of risk of bias showed an overall level of very low to moderate quality of evidence. **Table 2** presents the detailed risk of bias assessment of the studies.

**Table 2.** Evaluation of the risk of bias in included studies according to the grading of recommendations assessment, development, and evaluation (GRADE).

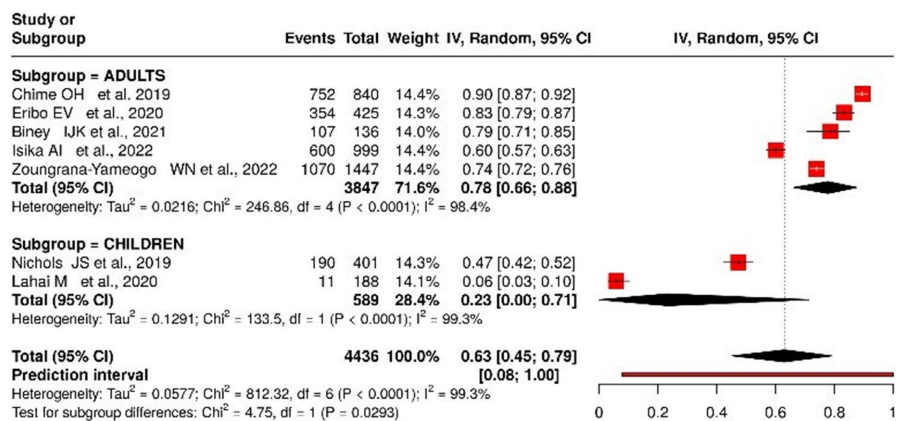
Study (year)	Study design	Population	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality of evidence
Biney <i>et al.</i> , 2021	Cross-sectional	Adolescents/youth	High	Minor	Direct	Moderate	Low
Chime <i>et al.</i> , 2019	Cross-sectional	Adults living with HIV	Low	Consistent	Direct	Serious	Moderate
Eribo <i>et al.</i> , 2020	Cross-sectional	Adults living with HIV	High	Consistent	Direct	Moderate	Low
Isika <i>et al.</i> , 2022	Cross-sectional	Adults living with HIV	High	Heterogeneous	Direct	Serious	Low-moderate
Lahai <i>et al.</i> , 2020	Cross-sectional	Children living with HIV	Very high	Inconsistent	Indirect	Serious	Very low
Nichols <i>et al.</i> , 2019	Cross-sectional	Uninformed children	High	Consistent	Indirect	Moderate	Low
Zoungrana-Yameogo <i>et al.</i> , 2022	Secondary data analysis	Mixed adult population	Low	Variable	Very direct	Serious	Moderate

### 3.4. Results of Individual Studies

Adherence ranged 5.9% - 89.5%.

### 3.5. Results of Syntheses

The study involved 4436 patients, and the overall adherence rate was estimated at 63%, CI95% [0.45 - 0.79]. The subgroup analysis noted a proportion of 78%, IC95% [0.66 - 0.88] in adults and a proportion of 23% IC95% [0.00 - 0.71] in children. The analysis showed a strong heterogeneity of study outcomes ( $I^2 = 99.3\%$ ,  $p < 0.001$ ). **Figure 2** presents the overall and subgroup estimates of adherence and heterogeneity analysis.

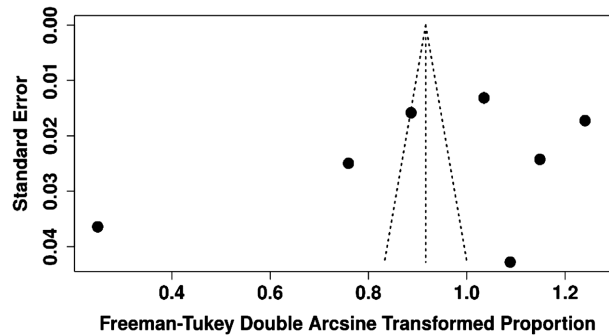


**Figure 2.** Forest plot showing overall and subgroup estimates of adherence and analysis of heterogeneity of antiretroviral treatment among patients living with HIV in West Africa.

### 3.6. Reporting Biases

Funnel plot asymmetry; Egger's test  $p < 0.05$ .

Significant heterogeneity was observed ( $p < 0.01$ ), indicating variable effects in terms of extent and/or direction of the effects. **Figure 3** illustrates the funnel diagram used to assess potential publication bias.



**Figure 3.** Funnel plot of study publication bias assessment.

### 3.7. Certainty of Evidence

Low certainty (GRADE) due to bias, heterogeneity, and imprecision.

## 4. Discussion

A variable level of adherence to antiretroviral (ARV) was observed, depending on the target population and over time. The overall proportion of subjects adhering to antiretroviral treatment was 0.63 with a 95% confidence interval [0.45 - 0.79] with a significant difference between adults (78%) and children (23%). Adherence rates fluctuate, with a downward trend between 2019 and 2022. This variability could be related to the subjects of the study since some studies were carried out in adult men and women, while others examined children and adolescents. The overall estimate of 63% provides an initial summary, but given the high degree of heterogeneity observed (99.3%) (probably due to the lack of standardization in the measurement of adherence and the small number of studies included in the meta-analysis), it is not appropriate to generalize this result.

Low adherence to ARVs drugs would imply a low probability of neutralizing their viral load and an increased risk of HIV transmission. Costa *et al.* in a systematic review published in 2018 and covering topics selected between 2005 and 2016 in Latin America and the Caribbean, reported that 44% of people living with HIV (PLHIV) had suboptimal adherence [12]. Angel *et al.* in their study published in 2023 and conducted among 19,322 people living with HIV and followed up between 2010 and 2020 in Canada, had an adherence rate of 55.3% [13]. Fassinou *et al.* in a systematic review conducted among pregnant and breastfeeding women in Sub-Saharan Africa had achieved an adherence rate of 62% [14]. Generally speaking, a significant proportion of people living with HIV are still not adherent to antiretroviral therapy.

Several factors could support this low level of adherence in the African context. These include difficulties in accessing health facilities related to distance from the [15], and instability of supply, particularly in areas affected by security challenges with its share of stock shortages. Stigma at the level of care facilities and in the community (fear of being identified as HIV positive by attending certain institutions such as hospitals of the day for people living with HIV) may also reduce the regularity of follow-up visits [16]. Lack of social support, or fear of family rejection, and non-disclosure of status to the partner have already been described as factors limiting motivation for adherence [17]. The lack of knowledge about HIV, the benefits of ARVs and the consequences of stopping treatment may also constitute barriers to adherence. Fear of side effects often described or presented by other PHAs may discourage regular and long-term [18]. Moreover, some adherence support strategies are poorly adapted or not adapted in certain contexts. A need to act holistically. The risks of stock shortage should be contained regardless of the geographical and security context. The provision of ARVs should be systematically accompanied by personalized support to remove barriers to adherence related to lack of awareness of ARV benefits, stigma in healthcare settings, adapted strategies are therefore necessary to achieve optimal adherence rates and, consequently, therapeutic success.

## 5. Limits of the Study

The limited number of studies included in our analysis, seven in total, including two in children, may limit the relevance of the results. Furthermore, the lack of a standardized definition of adherence led to the use of several estimation methods and significant heterogeneity in the analyses. Future studies using standardized methods of measuring adherence in West Africa are needed to enable more reliable comparisons and syntheses.

## 6. Conclusion

This study revealed low adherence to antiretroviral (ART) treatments, particularly among children, despite efforts to support adherence in the context of West Africa. Adapted strategies taking into account the shortcomings related to the supply system, dispensable from those related to socio-emotional factors, could enable the achievement of optimal adherence rates and, consequently, therapeutic success.

## Registration and Protocol

Details on the design and conduct of this systematic review and meta-analysis were recorded in the international database of prospectively registered systematic reviews in the field of health and social care (PROSPERO 2025 CRD420251008258).

## Support

This study did not receive any funding.

## Availability of Data, Code and Other Materials

An Excel database of selected studies is available.

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We would like to thank all the authors whose articles were used to produce this systematic review.

## Authors' Contributions

Dr. Zoungrana Wedminère Noëlie designed the study and wrote the first draft. Dr. Yameogo Aristide and Dr. Somé Anthony were independent researchers responsible for selecting articles. The other authors read the first draft and provided comments. Prof. Koiné Maxime Drabo supervised the research work.

## Conflicts of Interest

The authors declare no conflicts of interest.

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