BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-085169
Article Type:	Original research
Date Submitted by the Author:	08-Feb-2024
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Keywords:	Chronic Disease, Public health < INFECTIOUS DISEASES, Meta-Analysis, Infectious disease/HIV < NEUROLOGY, Patient Satisfaction

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Satisfaction with antiretroviral therapy services among people living with HIV/AIDS in Ethiopia. A systematic review and meta-analysis

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Abstract

Objectives: To determine the pooled prevalence of patient satisfaction with antiretroviral therapy among people living with HIV/AIDS in Ethiopia.

Design: A systematic review and meta-analysis was used. . International online databases (i.e., PubMed, Scopus, Hinari, and Google Scholar) were searched in order to identify original articles on patient satisfaction. Using a predetermined data extraction format, three authors independently extracted the required data. The heterogeneity of the studies was evaluated using the I2 test and the Cochrane Q test statistics. Data analysis was carried out using STATA Version 17 statistical software.

Settings: Studies conducted only in Ethiopia were included.

Participants: Twenty independent studies were eligible for this study.

Outcome: The magnitude of patient satisfaction among people living with HIV/AIDS. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to develop the review's publication selection, data extraction, and reported outcomes.

Result: The pooled prevalence of satisfaction with antiretroviral therapy services in Ethiopia was 69.78% (95% CI: 63.43–76.13). Regional variations in the pooled patient satisfaction with ART services were identified in the subgroup analysis, with Addis Ababa city administration having the highest at 85.96% (95% CI: 83.62-88.31) and Oromia region having the lowest at 63.15% (95% CI: 37.30 to 89.00).

Conclusion: More than two- thirds of People living with HIV/AIDS were satisfied with the a ntiretroviral therapy services in Ethiopia. There were regional differences in patient satisfaction with antiretroviral therapy services, with the Addis Ababa city administration having the highest rates and the Oromia region having the lowest. It is suggested that healthcare administrators and policymakers pay particular attention in order to improve patient satisfaction with antiretroviral therapy services, which has a substantial impact on patient retention in HIV/AIDS care services and medication adherence.

Protocol registration: The protocol for this systematic review was registered in the prospective register of systematic reviews (PROSPERO) with a registration number of CRD42023438589 on July 16, 2023.

Data availability statement: All relevant data are within the manuscript and its Supporting Information files.

Keywords: Antiretroviral therapy, Ethiopia, Health facility, People living with HIV/AIDS, Satisfaction.

Strength and limitation of this study

- The study was registered with PROSPERO.
- The quality of each original study was rated using the Newcastle-Ottawa Scale, a three-part technique for evaluating observational study quality.
- The study's limitation is that it is based on only 20 cross-sectional studies, and not all regions of Ethiopia are represented.
- The systematic review concentrated on observational studies, primarily cross-sectional.
- The meta-analysis included fewer publications, which may reduce statistical power, allow for substantial standard errors, and encourage publication bias.

Introduction

The Human Immunodeficiency Virus (HIV), which has killed 40.4 million [32.9–51.3 million] people worldwide, continues to be a serious global public health problem. The World Health Organisation (WHO) estimates that at the end of 2022, there will be 39.0 million [33.1-45.7 million] people living with HIV/AIDS (PLWHA) worldwide, with 25.6 million of them living in the WHO African Region (1). The number of patients receiving antiretroviral therapy increased from 7.7 million in 2010 to 29.8 million by the end of December 2022. Globally, the use of highly active antiretroviral therapy (HAART) has demonstrated impressive results, with a reduction in HIV/AIDS-related deaths and new infections of 45 and 23%, respectively, over the previous ten years (2).

An ambitious plan known as "90-90-90" that called for the diagnosis of 90% of people living with HIV/AIDS (PLWHA), antiretroviral therapy (ART) for 90% of those who were diagnosed as HIV-positive, and viral suppression in 90% of those receiving ART by 2020 has been recognised by the international public health community since 2014 (3).These initial targets were raised to "95-95-95" by 2030 in an effort to eradicate HIV as a threat to public health worldwide (4). The Joint United Nations Programme on HIV/AIDS (UNAIDS) also set a global goal to end the AIDS epidemic as a public health threat by 2030, in line with the three zeros vision: zero deaths, zero new infections, and zero discrimination. This goal is operationalized as a 90% reduction in annual new HIV infections, including among key populations like children; a 90% reduction in the stigma and discrimination experienced by people living with HIV and key populations; and a 90% reduction in AIDS-related deaths (5, 6).

In response to the HIV/AIDS epidemic, the Ethiopian government took action as early as 1985. As a result, the FMoH of Ethiopia has been executing a sector-wide reform to raise the standard and accessibility of ART care services in medical facilities across the nation (8). Thus, the ART program's rapid expansion offered an once-in-a-lifetime chance to quickly scale up HIV/AIDS prevention, care, and treatment services. The expansion of ART access has received a lot of attention, and treatment regimen adherence is a key factor in determining ART effectiveness (9). But in many low-income nations that have been most severely affected by the HIV epidemic, it is still difficult to reach the universal access aim of high-quality HIV/AIDS healthcare services and optimal patient satisfaction (10, 11).

According to the Federal Ministry of Health of Ethiopia (FMoH), the adult (15–49) HIV prevalence was 0.93% in 2019, with a significant regional variation ranging from a high in Gambella at 4.5%, in Addis Ababa at 3.42%, and a low in the Somali region at 0.01%. Since the ART programme has been rapidly expanded in Ethiopia, the number of AIDS-related deaths has dramatically decreased, with a 52% decrease in AIDS deaths in 2019 compared to the level in 2010. As of December 2019, of the total 79% of estimated PLHIVs that knew their status, 90% were taking ART, and 91% had viral suppression (7).

Patient satisfaction, which has been widely described as the "cognitive and emotional response to the elements of care delivery and service (12)," has been found to be a sign of the quality of medical services and a significant predictor of overall health outcomes (13, 14). Patient satisfaction is crucial to HIV management since it increases hospital visits, drug adherence, follow-up visits, turn-over rates, and drop-out rates, which all contribute to a decrease in the disease's rates (15). Moreover, patients who are satisfied with their care often adhere better to their treatment plans, remain actively involved in their care throughout follow- up appointme nts, and seek further advice and care, especially for those on long-term treatment like ART (16-18). On the other side, dissatisfied patients are more likely to suffer catastrophic effects, such as treatment regimen non-compliance, which leads to the emergence of opportunistic infections and medication resistance. They could also fail to follow up on medical care and disseminate negative information that might discourage others from using a health provider (19).

In the medical sector, a key performance and outcome metric is patient satisfaction with healthcare services. In order to make health care programmes more patient-centred and efficient in light of limited resources, it may be helpful to learn how patients rate their care. This will allow for the identification of problems and the development of solutions (15, 20). In order to make the best use of the healthcare system's limited resources, it is crucial to assure patient satisfaction and high-quality care (15). This is because patient satisfaction is a reflection of the discrepancy between what is expected and what is really received from the services provided (20). These factors have evolved into a tool to capture the interest and value of both patients and medical professionals (21). However, little is known about the overall level of patient satisfaction with ART services in Ethiopia.

The few published studies on patients' satisfaction with ART therapy in Ethiopia revealed that the prevalence ranges from 46% in a study among health facilities in the East Showa, Oromia, and Wolaita zones of Ethiopia to 90.8% in studies conducted in health facilities in Hawassa

and Yirgalem, which have mainly been small-scale and had a small sample size (8, 22-26). However, as to our level of knowledge there is no study that report the overall national prevalence of patient satisfaction with ART services in Ethiopia. Therefore, we set out to conduct a systematic review and meta-analysis in order to ascertain the pooled prevalence of patient satisfaction with ART services in Ethiopia. The study's findings highlight patient satisfaction as a key factor in HIV care retention in Ethiopia and contribute to knowledge.

Materials and methods

Study settings and design

This study was carried out in Ethiopia, a country in north-eastern Africa also referred to as the Horn of Africa, bordered by Kenya, South Sudan, Sudan, Djibouti, Eritrea, and Somalia. Ethiopia currently ranks second in Africa in terms of population behind Nigeria, with an estimated 123,415,729 people as of July 16, 2023 (21).

Protocol registration and reporting

The protocol for this systematic review was registered in the prospective register of systematic reviews (PROSPERO) with a registration number of CRD42023438589 on July 16, 2023. This systematic review approach was developed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (27) (Supplementary (table1)).

Searching strategy and source of information

A number of primary studies on the prevalence of patient satisfaction with ART services provided among Ethiopian healthcare facilities were searched and discovered using international online databases (PubMed, Scopus, Hinari, and Google Scholar) without regard to publication date from July 20, 2023, to August 20, 2023. Additionally, the Digital Library of an Ethiopian institution was searched for unpublished works pertinent to this systematic review and meta-analysis. The "AND" and "OR" Boolean operators were used to create the search query individually or in combination. The following keywords: prevalence, patient satisfaction, antiretroviral therapy, health facilities, and Ethiopia were used for the search strategy.

The search details for PubMed were: ((Period Prevalence [MeSH Terms]) OR (Point Prevalence [MeSH Terms]) AND (Patient Satisfaction [MeSH Terms]) OR (Client Satisfaction [MeSH Terms])) AND (anti-retroviral agents [All Fields] OR anti-retroviral agents [All Fields] OR anti-retroviral agents [MeSH Terms] OR Antiretroviral [Text Word])))))))) AND (therapy [Subheading] OR therapeutics [MeSH Terms] OR therapy [Text Word]) AND "health facilities

[MeSH Terms] OR health facility [Text Word] AND Ethiopia [MeSH Terms] OR Ethiopia [Text Word].

Three independent researchers (HEH, DSW, and BGD) identified the appropriate studies, while a fourth and fifth researcher (MA and EA) settled any disputes. To collect, organise, and remove duplicate search outcomes, Endnote software was employed.

Study selection and process

The CoCoPop (Condition, Context, and Population) mnemonics were used to establish inclusion and exclusion criteria for prevalence studies. To identify the articles that were included, three researchers (HEH, DSW and BGD) separately looked through the titles, abstracts, and full texts of the articles. The articles that fulfil screening criteria were compiled together by two researchers (HEH, DSW and BGD), and disagreements were settled by consensus with the help of the other reviewers (MA, and EA). The articles included in this systematic review and meta-analysis, which looked at the proportion of patient satisfaction with antiretroviral therapy services in Ethiopian health facilities, were chosen based on the criteria listed below.

Inclusion criteria

Population: Adult people living with HIV/AIDS

Outcomes of interest (condition): Articles that reported on the percentage of patient satisfaction for the antiretroviral therapy service provided by the healthcare facility were included in this review.

Study settings (context): Studies conducted only in Ethiopia.

Study design: All types of observational studies (cross-sectional, case-control, and cohort) were included.

Language: The review included only English-language studies.

Publication status: Both published (journal articles) and unpublished (master's theses and dissertations) articles without restriction of date of publication were included.

Exclusion criteria

Articles that fail to report the main outcome of interest are excluded. Systematic reviews, brief communications, letters to the editor, comments, qualitative research, and articles that were difficult to access in full (after contacting the authors in question via email to request the complete texts) were also excluded.

Data extraction process

All the relevant data was separately gathered by two authors (HEH and MA) from the primary articles. The data were extracted using a defined data extraction format that was created as a summary table in a Microsoft™ Excel spreadsheet. The data extraction from each abstract and/or full text of the article that was considered eligible includes the name of the first author followed by initials, region, study area, publication year, study design, study setting, sample size, response rate, and the outcome of interest (prevalence of patient's satisfaction with ART service). It also included information on the study's sample size, and response rate.

Outcome measurement

For this systematic review and meta-analysis, one primary outcome were considered which is the pooled prevalence of patient satisfaction with ART services provided by health facilities in Ethiopia, which was calculated by dividing the number of PLWHA satisfied with ART services by the total sample size and multiplying by 100.

Assessment of the quality of the individual studies

To evaluate the quality of the included studies in this systematic review and meta-analysis, the Newcastle-Ottawa Scale for cross-sectional study quality assessment was adapted (28). Following the NOS scale's recommendations, we used the following domains to assess the included studies: **Domain 1: Selection (5 stars)** included the following criteria's: representativeness of the sample (1 star), sampling technique (1 point), response rate (1 star), and ascertainment of exposure (2 stars); **domain II: Comparability (2 stars)** included confounding control (data/results adjusted for relevant predictors/risk factors/confounders (2 stars); **domain III: Outcome (3 stars**) included outcome assessment (2 stars) and statistical tests (1 star). Points 0–5 were regarded as low quality, points 6–7 as moderate quality, and points 8–10 as good quality. Finally, articles with a score of ≥ 6 out of 10 were considered high quality and included in the Meta-analysis. The quality of the primary studies was evaluated independently by the two authors (HEH and MA). Any disagreements that might have arisen between the two authors while evaluating the quality of individual studies were resolved through conversation and with the assistance of the other authors (DSW and EA).

Data processing and analysis

The data were exported into STATA/SE version 17 statistical software for analysis after being extracted using a Microsoft Excel spreadsheet. Heterogeneity was assessed using the P-value result of the I^2 statistic and the Cochrane Q-test (29). A P-value of < 0.10 denotes statistically

significant heterogeneity, and values of 25%, 50%, and 75% were used to categorise the heterogeneity result as low, medium, and high, respectively (30, 31). Therefore, DerSimonian and Laird's pooled effect was calculated using a random effects meta-analysis model. With a 95% confidence interval, the estimated pooled prevalence of patient satisfaction with ART services was determined. Forest plots were used to illustrate the estimated pooled values. A subgroup analysis by publication year, sample size, and research region was conducted to reduce the random variation between the point estimates of the primary studies. In order to statistically evaluate publication bias, the Egger weighted regression and Begg rank correlation test methods were used (a two-sided p-value of ≤ 0.05 was regarded as suggestive of statistically significant publication bias), and the forest plot was also used to graphically (visually) represent the presence of heterogeneity (32), based on the presumption that, in the absence of publication bias, the effect sizes of all the studies are normally distributed about the middle of a funnel plot, the trim-and-fill analysis was also performed to evaluate for and correct any publication bias (33). Moreover, univariate meta-regression and sensitivity analysis were carried out to evaluate the impact of a single study on the total pooled estimate and identify potential sources of heterogeneity, respectively. Text, tables, and graphs were employed to present the study's findings.

Patient and public involvement

None.

Results

Study selection and identification

A total of 48,642 studies were examined; 36430 of these were removed due to duplication. 11,797 studies out of 12,212 articles were removed from consideration for this review as being not relevant to this review on the basis of their titles. The remaining 415 studies were screened by their abstracts, yielding an additional 302 studies to be excluded. Moreover, based on the predetermined inclusion criteria, 133 full-text articles were evaluated for eligibility; 113 of these articles were excluded because they failed to meet the following criteria: the outcome was not clearly reported, the measurement was of poor quality, the study was carried out outside of Ethiopia, the full text was not available, and the target population was incorrectly selected. Finally, for this systematic review and meta-analysis, 20 potential studies that fulfil the eligibility and quality assessment criteria were included (Figure 1).

Characteristics of the included studies

The 20 articles that were included were all facility-based cross-sectional studies, and they were all published. The number of participants in the included studies ranged from a low of 261 in one study in Dire Dawa, eastern Ethiopia (34), to a maximum of 721 in another study in the Tigray region (26). The review covered a total of 7827 participants aged 18 and older. In various parts of the nation, the primary studies were published between 2009 and 2023. Two city administrations (Addis Ababa and Dire Dawa) and five regions of Ethiopia were included in this review.

According to Ethiopia's regional states and administrative cities, this systematic review and meta-analysis included two studies from Addis Ababa city administration (25, 35), six from Amhara region (8, 36-40), one from Dire Dawa city administration (34), one from Harari Region (41), three from the Oromia region (22, 42, 43), five from the South National and Nationalities of People's Region (SNNPR) (9, 23, 24, 44, 45), and two from Tigray regional state (26, 46). There were no studies reviewed from Afar, Benishangul Gumez, Gambella, or the recently established regional states of Ethiopia. When we characterise the study according to the facility were they conducted, 13 were from the hospital, 4 from both hospital and health centre, and 3 from the health centres.

A study conducted in the Hawassa and Yirgalem hospital, Southern Ethiopia revealed the highest prevalence of patient satisfaction with ART services (90.8%) (24), while a study conducted in the Oromia region revealed the lowest prevalence (46.2%) (22). Nearly all studies had a high response rate (>91.6%), which might be attributable in part to the use of interviewer-administered questionnaires for data collection (Table 1).

Quality of included study

Based on the quality assessment (NOS) score, we found that all research included in this systematic review and meta-analysis had reliable methodological quality, with scores ranging from 6 to 10 out of a possible 10 NOS points. We found that the degree of bias for the studies that were part of the final analysis ranged from moderate to almost perfect agreement (Supplementary (table 2)).

Table 1: Characteristics of the studies included in the systematic review and meta-analysis to show the prevalence of patient satisfaction with antiretroviral therapy services in Ethiopia.

Author name	publication year	Study Area	Study Setting	Region	Sample Size	Response rate (%)	Prevalence (95%CI)
Abebe TB et al.(8)	2022	Gondar university	Hospital	Amhara	291	98.3	54.7
Addisu G et al. (36)	2020	Gondar town	Health Centre	Amhara	663	100	75.4
Alemayehu YK et al.(37)	2009	Bahirdar	Hospital	Amhara	368	100	78
Atsebeha KG et al.(46)	2018	Midre-genet (Shire – Endaslassie	Hospital	Tigray	422	99.5	75.2
Badacho AS et al.(44)	2023	Wolaita zone	Both	Southern Ethiopia	615	98.4	70.7
Belay M et al.(24)	2013	Hawassa and Yirgalem	Hospital	Southern Ethiopia	422	100	90.8
Belete TM et al.(38)	2023	Dembia district	Both	Amhara	308	100	76.95
Doyore F et al.(9)	2016	Hossana Town	Both	Southern Ethiopia	301	100	70.1
Eshetu A et al.(34)	2013	Dire Dawa	Hospital	Dire Dawa	261	91.6	54.6
Gezahegn M et al.(42)	2021	Jimma Town	Both	Oromia	383	100	85.5
Habtamu A et al.(43)	2017	Western Wollega Zone	Hospital	Oromia	266	95.8	57.6
Mekonnen T et al.(41)	2021	Harar town	Hospital	Harari	413	98	76.9

Mindaye T et al.(25)	2012	Addis Ababa	Hospital	Addis Ababa	422	96.2	85.5
Nigussie T et al.(45)	2020	Mizan-Tepi University	Hospital	Southern Ethiopia	356	97.7	55.2
Tawiye NY et al. (39)	2021	Dessie	Hospital	Amhara	375	96.5	64.1
Tebeje M et al.(40)	2020	Bahirdar	Hospital	Amhara	422	100	53.3
Tessema SB et al.(26)	2015	In five zones of Tigray region	Health Centre	Tigray	721	99.03	89.6
Tiruneh CT et al.(35)	2021	Addis Ababa	Hospital	Addis Ababa	420	100	86.4
Yakob B et al.(23)	2016	Wolaita Zone	Both	Southern Ethiopia	485	99.5	46.4
Yilma TA et al.(22)	2021	East Shoa Zone	health Centres	Oromia	398	100	46.2

Prevalence of patient satisfaction with ART services in Ethiopia

The random effects model was used to estimate the pooled prevalence because there is significantly high heterogeneity among the included studies (I^2 = 98.08%; P- value < 0.001). As a result, the pooled prevalence of patient satisfaction with ART services among the 20 included studies in Ethiopia was 69.78% (95% CI: 63.43–76.13) (Figure 2).

Publication bias

The presence of possible small study effects was checked by using a funnel plot by visually inspection, Begg's and Egger's regression test to declare the presence of publication bias. The asymmetrical distribution of the included articles in a funnel indicated the presence of a publication bias (Figure 3). The Begg (p - value = 0.001) and Egger tests (p -value = 0.000) both revealed there is significant publication bias among the studies included to estimate the pooled prevalence of patient satisfaction on ART services in Ethiopia.

Therefore, to account the publication bias trim and fill analysis was considered. Therefore, the trim and fill analysis showed that the estimated pooled prevalence of patient satisfaction with

ART service among PLWHA in Ethiopia appeared to be 69.78% (95% CI: 63.43 to 76.13) after adjusting for publication bias. This value did not differ from the unadjusted pooled prevalence of patient satisfaction in the random effect model, which also had a similar significant level of heterogeneity among the studies (I^2 = 98.08%; p = 0.000) (Supplementary (figure1)).

Sub-group and meta-regression analysis

Subgroup analyses were conducted by study region, year of publication, sample size, and study settings in order to identify the potential source of study heterogeneity. The subgroup analysis by Ethiopian regions revealed that the greatest estimates of patient satisfaction with ART services were reported in the Addis Ababa city administration, at 85.96% (95% CI: 83.62 to 88.31), and in the Tigray region, at 82.51% (95% CI: 68.40, 96.62). The lowest was in the Oromia region, with 63.15% (95% CI: 37.30, 89.00).

In order to determine whether there were any variations in patient satisfaction with ART service from year to year, a subgroup analysis depending on the year of publication was also carried out. As a consequence, the pooled proportion of patients who were satisfied with the ART service was found to be 72.12% (95% CI: 62.15 to 82.09) before and at 2018.

The highest pooled prevalence of 73.8% (95% CI: 60.53 to 87.02%) for sample sizes above 416 was found in the sub-group analysis of patient satisfaction with ART service by sample size. Finally, the high value of I2, indicates that the sample size, study setting, study region, and publication year all had an impact on the variation in the estimates of patient satisfaction (Table 2).

In addition to subgroup analysis, meta-regression was also assumed by taking into account both continuous and categorical data to find associated causes of heterogeneity for the pooled prevalence of patient satisfaction with ART services. The meta-regression took into account the sample size, response rate, study setting (facility), publication year, and study region. However, the meta-regression revealed that publication year, response rate, sample size, and study region were not related to the pooled prevalence of patient satisfaction with ART services (Supplementary (table 3)).

Table 2: The pooled estimate of satisfaction among people living with HIV/AIDS, 95% CI, and heterogeneity estimate with a p-value for the subgroup analysis.

Variables	Categories	Number of studies	Pooled estimates (95%CI)	I^2 (p- value)
Region	Addis Ababa	2	85.96% (83.61,88.31)	0.00% (0.71)
	Amhara	6	67.18% (58.53,75.83)	95.56% (< 0.001)
	Eastern Ethiopia	2	65.87% (44.01, 87.72)	97.23% (< 0.001)
	Oromia	3	63.15% (37.30, 89.00)	98.90% (< 0.001)
	Southern Ethiopia	5	66.69% (49.99,83.40)	98.85% (< 0.001)
	Tigray	2	82.51% (68.40, 96.62)	97.25% (< 0.001)
Publication year	≤ 2018	9	72.12% (62.15,82.09)	98.41% (< 0.001)
	> 2018	11	67.86% (59.96,75.77)	97.48 (< 0.001)
Sample size (mean)	≤ 416	15	68.42(60.99,75.86)	97.75% (< 0.001)
	> 416	5	73.78% (60.53,87.02)	98.82% (< 0.001)

Sensitivity analysis

Leave-one-out sensitivity analysis were conducted, the random effects model revealed no single study significantly impacted patient satisfaction with ART services, with no point estimates exceeding the 95% confidence interval (Supplementary (figure 2)).

Discussion

Patient satisfaction plays a crucial role in assessing the level of service quality provided by healthcare professionals (47, 48). Assessment of patient satisfaction can also help identify unmet patient needs and targeted interventions, improve the performance of health services, a nd predict treatment adherence and outcomes (49, 50). In this systematic review and meta-analysis, the pooled prevalence of patient satisfaction with antiretroviral therapy services in Ethiopia was 69.78% (95% CI: 63.43–76.13%). This result is comparable with a study conducted in Spain, where out of a total of 533 HIV patients getting ART, 71.9% reported being satisfied with the ART service (56), with the study done in China, where 67.1% of the participants said they were very satisfied with the medical care they received (57),with studies conducted in Nigeria, where between 67.5% and 77% of PLWHA patients at an antiretroviral

clinic reported being satisfied with their care (51-54), with a study conducted in Uganda, where 64.2% were satisfied with HIV care services (55).

The findings of this systematic review and meta-analysis were higher compared with the results of study conducted in Ukraine, where 55.6% of the patients reported being satisfied with their HIV/AIDS care (61), and a study conducted in Pakistan, in which 57.7% of people living with HIV/AIDS attending the HIV/AIDS clinic were satisfied with the health care services (62), study conducted in Vietnam, where 42.4% of patients reported being satisfied with all elements of their HIV/AIDS care (58), studies carried out at various Nigerian health facilities, where it was discovered that patient satisfaction with ART services ranged from 46.9% to 52% (59, 60).

This finding was lower than a study done in Brazil that divided the service into decentralised facilities (a central hospital) and decentralised health units, where patient satisfaction with HIV/AIDS health services was 81% and 86%, respectively (67), with another Brazilian study in which 96.7% individual satisfied with healthcare services after three months of initiation of antiretroviral therapy (50), with a study conducted in Russia, where 86% of the sample reported a high degree of satisfaction with HIV care delivery (68), and India (92.6%) (66).

Moreover, the finding was lower than the African Cohort Study (AFRICOS), a prospective observational study conducted at PEPFAR-supported clinics in four African countries, in which 89.6% of PLWHIV reported being satisfied with their care (63), five Gert Sibande district hospitals in South Africa (98%) (21),Cameroon (91.2%) (65), and the patient satisfaction with the ART services provided by the facilities from studies conducted in Tanzania (92.3%)(64). The difference may result from difference in quality of service, infrastructure design, time management, resource allocation, and work environment arrangements. The disparity could also be brought about by variations in the clinical, sociodemographic or psychological characteristics of the patient. Furthermore, it's possible that healthcare facilities in the study's setting are only concerned with enrolling more patients in treatment in order to reduce HIV-related mortality rather than with features of treatment delivery that can affect patients' satisfaction. PLWHA may have a higher risk of developing mood, anxiety, and cognitive impairment due to the side effects of their illness and the impact of the self-acceptance process of their situation, which is another explanation for their lower satisfaction with ARV treatment services (69).

Regional variations in patient satisfaction with ART services were observed in the subgroup analysis. The results showed that the Addis Ababa city administration, with 85.96% (95% CI: 83.62–88.31), and the Tigray region, with 82.51 (95% CI: 68.4–96.62), respectively, had the

highest proportions of patient satisfaction with ART services. While the lowest were in Oromia and eastern Ethiopia, both at 63.15% (95% CI: 37.30 to 89.00) and 65.87 (95% CI: 44.01–87.72), respectively. The variations in diagnostic facilities, infrastructure, and a qualified and sufficient number of health professionals, as well as efforts to improve the service delivery process and variations in the accessibility and availability of free medications across regions, may account for the variations in the prevalence of patient satisfaction with ART services. Additionally, there may be variations in the methods used to measure patient satisfaction with the ART service as well as in the parameters that were used to do so. This finding therefore calls for the development and dissemination of evidence-based decisions, which call for designing and implementing appropriate interventions to address the quality of health services and infrastructure, increase accessibility and availability of free medications, and enable health care facilities to understand and improve their performance in order to increase patient satisfaction with ART service.

Practical implications of the study

The practical implications of the findings of this systematic review and meta-analysis highlight the necessity of ongoing quality assessment and improvement initiatives at the regional and national levels to make sure that PLWHA are happy with the ART services they receive at public health institutions both at the time of their visit and upon discharge.

Continuous in-service training and performance reviews with a professional development focus are necessary to advance relevant technical, interpersonal, and client care skills. These measures help patients stay on HIV care and treatment, which is a crucial quality indicator in HIV management. Moreover, they increase retention in HIV/AIDS care services and adherence to treatment by increasing people's satisfaction with the provided services.

Conclusion and recommendations

More than two-thirds (69.8%) of the PLWHA in this systematic review and meta-analysis were satisfied with the antiretroviral therapy services provided in Ethiopia. There were regional differences in patient satisfaction with ART services, with the Addis Ababa city administration having the highest rates and the Oromia region having the lowest. As a result, we suggested a number of strategies for improving patient satisfaction in HIV health care, including improving the physical environment, empowering patients to make decisions regarding their own therapies, and expanding access to medical personnel, equipment, and laboratory services, all of which help to increase adherence to ART, retention in HIV care services, and the quality of life among PLWHA. In order to reduce HIV-related mortality, it is advised that in addition to

increasing the number of patients receiving treatment, policymakers and healthcare organizations should also pay attention to aspects of treatment delivery that may have an impact on patient satisfaction. Moreover, in order to increase the satisfaction of PLWHA who are receiving ART, which will have an effect on adherence to antiretroviral medication, better communication between medical staff and PLWHA must be encouraged.

Abbreviations

ART: Antiretroviral Therapy, **AIDS**: Acquired Immunodeficiency Syndrome, **CI**: Confidence Interval, FMoH: Federal Minister of Health, **HIV**: Human Immunodeficiency Virus, UNAIDS: Joint United Nations Programme on HIV/AIDS, **PLWHA**: People living with HIV/AIDS, **SNNPR**: South National and Nationalities of People's Region, PROSPERO: Prospective Regi ster of Systematic Reviews, PRISMA: Preferred Reporting Items for Systematic Reviews and Meta- Analyses, **WHO**: World health Organization.

Ethical approval and consent to participate

This study does not involve any human or animal subjects and is based on previously available materials; thus, ethical approval is not required.

Consent for publication

Not applicable

Acknowledgments

We would like to thank Dilla and Addis Ababa University, Ethiopia, for providing free access to the online library so that you can browse the electronic databases.

Data Availability statements

All relevant data are within the manuscript and its Supporting Information files.

Funding statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests

The authors have declared that no competing interests exist.

Authors contribution's

HEH: conceptualization, preparation of the original draft, methodology, statistical analysis, and development of tools**. BGD, DSW, MA, and EA** participated in the investigation, software

validation, statistical analysis, and manuscript preparation. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

Supplementary file

Supplementary (Table 1). PRISMA (Preferred Reporting Items for Systematic review and Meta-Analysis) 2020 checklist: an updated guideline for reporting systematic reviews.

Supplementary (Table 2). Quality assessment of studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis of satisfaction with ART service among people living with HIV/AIDS in Ethiopia.

Supplementary (Table 3). Meta-regression analysis to identify possible factors of heterogeneity among the included studies.

Supplementary (Figure1). The plot of trim-and-fill analysis for the prevalence of patient satisfaction with ART service in the health facility of Ethiopia.

Supplementary (Figure 2). Sensitivity analysis of the prevalence of patient satisfaction with ART services for each study being removed at a time: prevalence and 95% confidence level.

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Figure legend

Figure 1: PRISMA flowchart of the study selection and identification process on Patient satisfaction with Anti-Retroviral Therapy (ART) Services in Ethiopia.

Figure 2: A forest plot showing the pooled prevalence of patient satisfaction with ART services in Ethiopia.

Figure 3: funnel plot displaying the publication bias of studies reporting the pooled prevalence of patient satisfaction with ART services in Ethiopia.

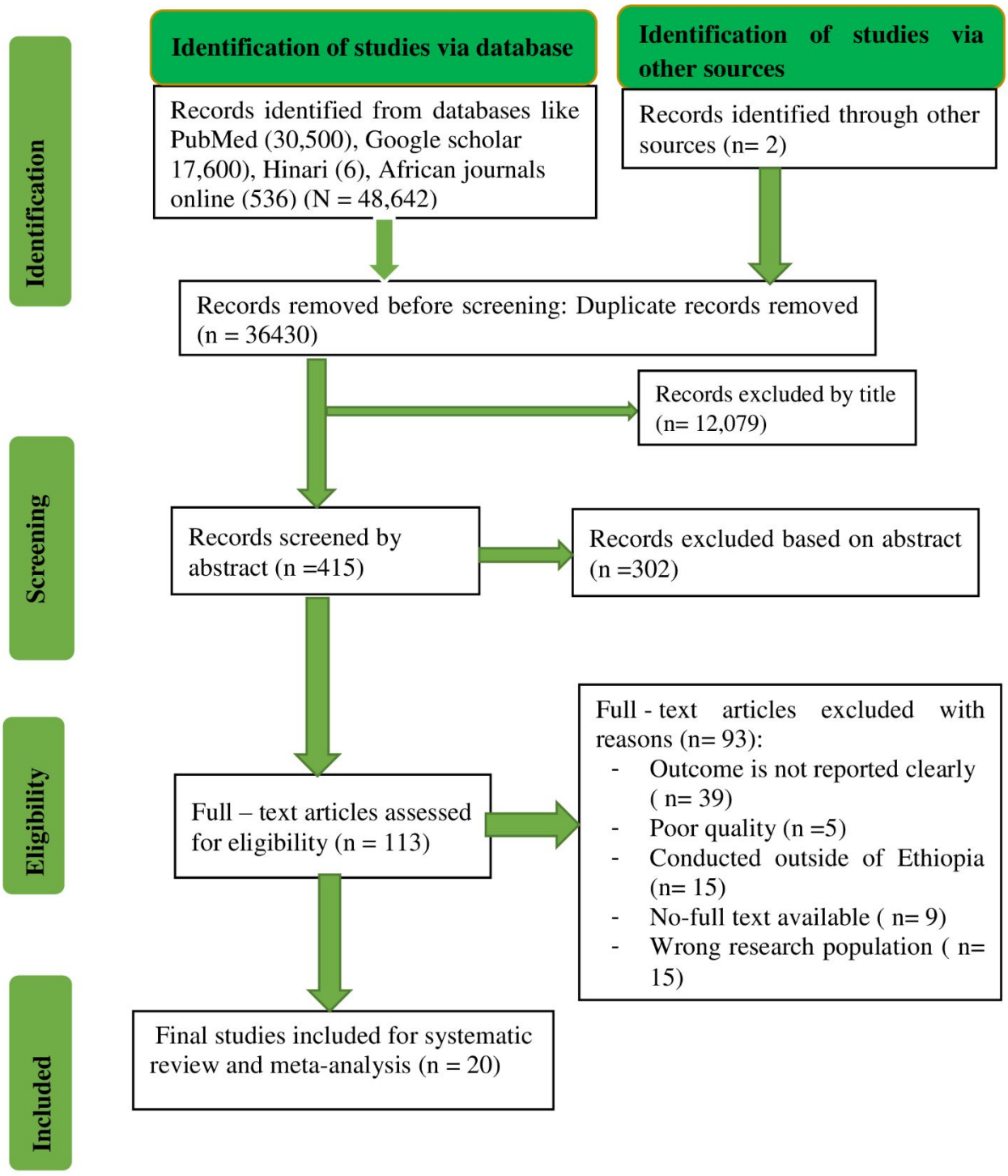


Figure 1: PRISMA flowchart of the study selection and identification process on Patient satisfaction with Anti-Retroviral Therapy (ART) Services in Ethiopia.

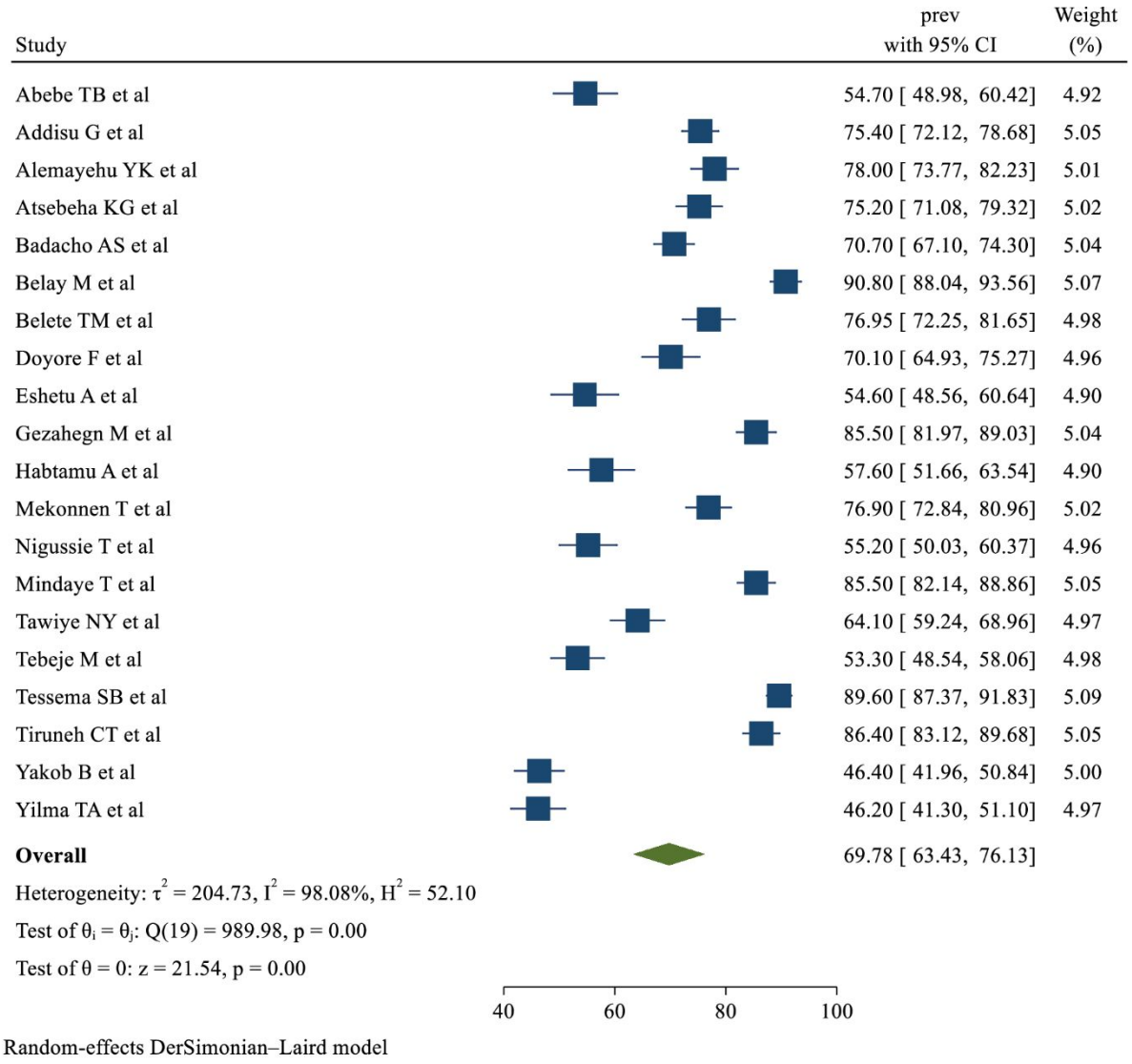


Figure 2: A forest plot showing the pooled prevalence of patient satisfaction with ART services in Ethiopia.

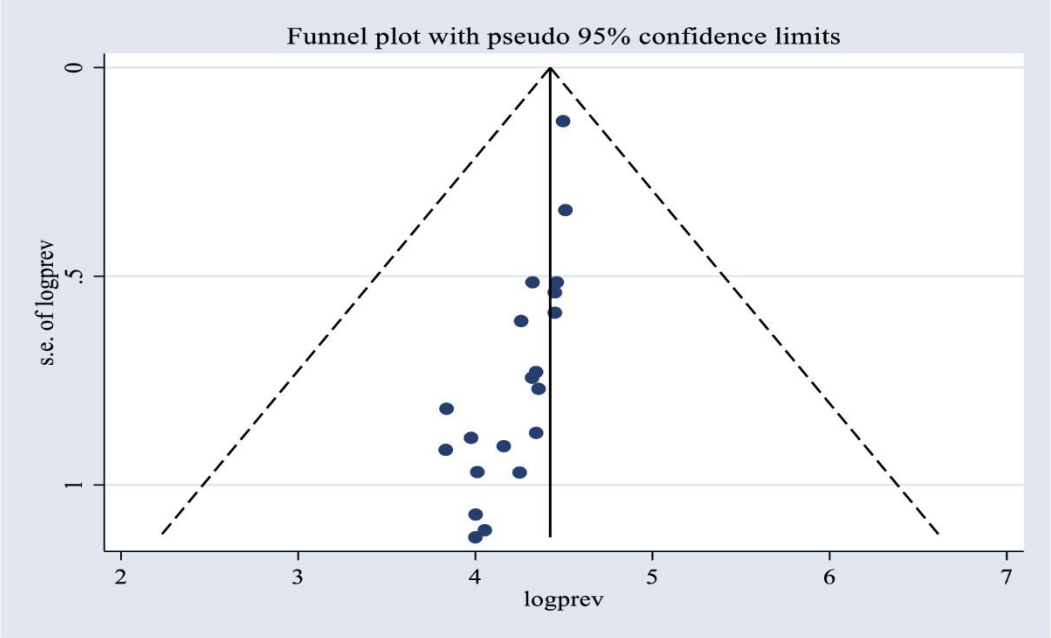


Figure 3: funnel plot displaying the publication bias of studies reporting the pooled prevalence of patient satisfaction with ART services in Ethiopia.

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	i
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	ii
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	1
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	2 -3
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	3
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	3- 4
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	5
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	5
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	5
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	5 - 6
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	6
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	6
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	6
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	6
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	5- 6
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	6
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	6
Certainty	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	6

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
assessment			
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	6-7
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	6-7
Study characteristics	17	Cite each included study and present its characteristics.	8 - 9
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	8
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	10 - 11
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	11 -12
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	13 -18
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	13 -18
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	19
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	13 -18
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	13 -18
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	20
	23b	Discuss any limitations of the evidence included in the review.	22
	23c	Discuss any limitations of the review processes used.	22
	23d	Discuss implications of the results for practice, policy, and future research.	21
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	3
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	3
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	23
Competing interests	26	Declare any competing interests of review authors.	23
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	23

PRISMA 2020 Checklist

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

(Supplementary table 2). Quality assessment of studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis of satisfaction with antiretroviral therapy services among people living with HIV/AIDS in Ethiopia.

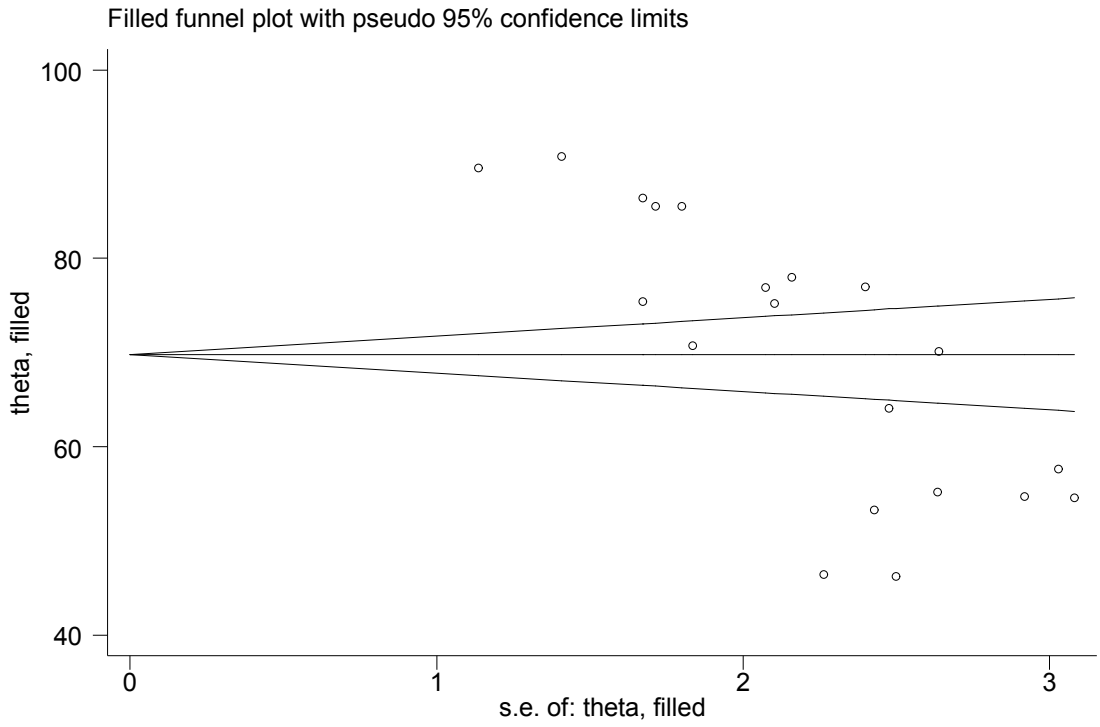
	Selection (5 stars)				**Comparability (2 stars)**	**Outcome (3 stars)**		
Study ID	Representativeness of the sample(*)	Sample size(*)	Non-respondents(*)	Ascertainment of the exposure(**)	Confounding factors controlled (**)	Assessment of outcome (**)	Statistical test(*)	Total quality score **(10*)**
Abebe TB et al.(8)	*	*	*	-	**	**	*	******** (8)
Addisu G et al. (36)	*	*	*	**	**	**	*	********* (10)
Alemayehu YK et al.(37)	*	*	*	-	-	**	*	******(6)
Atsebeha KG et al.(46)	*	*	*	**	**	**	*	*********(10)
Badacho AS et al.(44)	*	*	*	**	**	**	*	*********(10)
Belay M et al.(24)	-	*	*	*	**	*	*	*******(7)
Belete TM et al.(38)	*	*	*	*	**	**	*	********* (9)
Doyore F et al.(9)	-	*	*	*	*	**	*	*******(7)
Eshetu A et al.(34)	*	*	-	*	*	*	*	*******(6)
Gezahegn M et al.(42)	*	*	*	*	**	**	*	********* (9)
Habtamu A et al.(43)	*	*	-	*	**	**	*	******** (8)
Mekonnen T et al.(41)	*	*	*	**	**	**	*	*********(10)

Mindaye T et al.(25)	*	*	*	**	**	*	*	********* (9)
Nigussie T et al.(45)	*	*	*	*	**	**	*	********* (9)
Tawiye NY et al. (39)	*	*	*	**	**	*	*	********* *(10)
Tebeje M et al.(40)	*	*	*	*	-	**	*	******* (7)
Tessema SB et al.(26)	*	*	*	*	**	**	*	********* (9)
Tiruneh CT et al.(35)	*	*	-	*	**	**	*	******** (8)
Yakob B et al.(23)	*	*	*	*	**	**	*	********* (9)
Yilma TA et al.(22)	*	*	*	**	**	**	*	********* * (10)

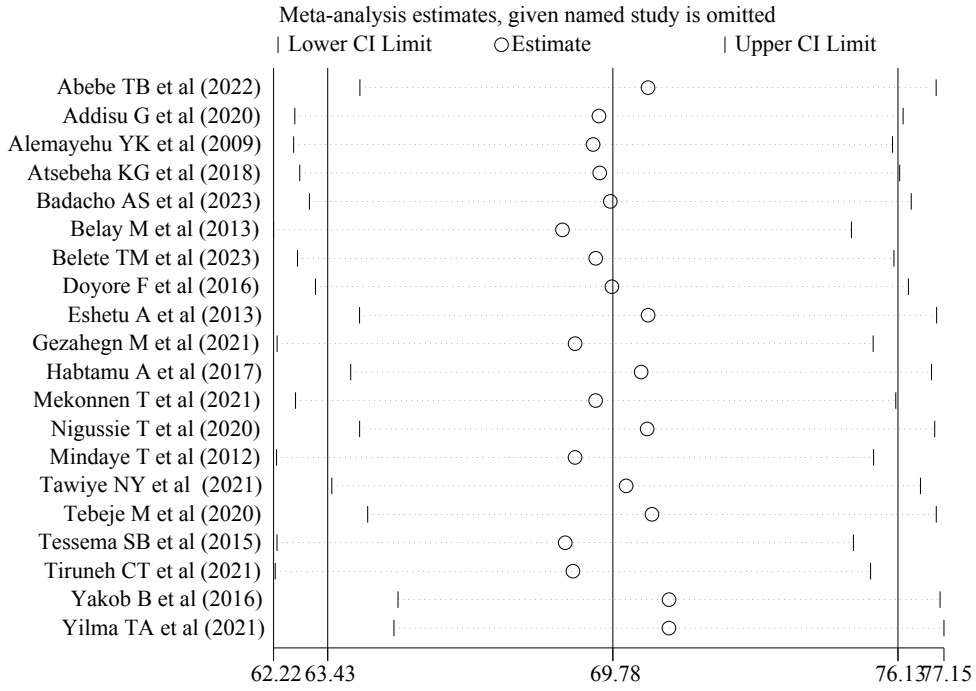
Supplementary (table 3). Meta-regression analysis to identify possible factors of heterogeneity among the included studies.

Variables		**Number of studies**	**Coefficients**	**95% CI**	**I^2**	**P - value**
Publication year (categorical)	≤ 2018	9	Reference			
	> 2018	11	- 4.288391	-16.92- 8.34	98.00	0.506
Publication year (continuous)		20	- 0.7837371	-2.35 - 0.78	97.94	0.328
Study region	Addis Ababa	2	Reference			
	Amhara	6	-18.82177	-42.98 - 5.34		0.127
	Eastern Ethiopia	2	-20.07489	-49.75 - 9.60		0.185

	Oromia	3	-22.72844	-49.78 - 4.32		0.100
	Southern Ethiopia	5	-19.22427	-43.97 - 5.53		0.128
	Tigray	2	-3.500606	-33.05 - 26.04		0.816
Study setting (facility)	Hospital	13	6.089888	-10.98 - 23.16		0.485
	Health centre	3	5.598502	-17.14 - 28.34		0.629
	Both	4	Reference			
Sample size (continuous)		20	0.0408098	-0.01 - 0.09	97.89	0.117
Sample size (categorical)	≤ 416	15	Reference			
	> 416	5	5.361918	-9.62 - 20.34	98.11	0.483
Response rate		20	1.922583	-1.17 - 4.95	98.07	0.214



Supplementary (figure1). The plot of trim-and-fill analysis for the prevalence of patient satisfaction with ART service in the health facility of Ethiopia.



Supplementary (figure 2). Sensitivity analysis of the prevalence of patient satisfaction with ART services for each study being removed at a time: prevalence and 95% confidence level.

BMJ Open

Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia. A systematic review and meta-analysis

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-085169.R1
Article Type:	Original research
Date Submitted by the Author:	18-Dec-2024
Complete List of Authors:	Hareru, Habtamu; Dilla University College of Health Sciences, School of Public Health Ashuro, Zemachu; Dilla University College of Health Sciences, Department of Environmental health Debela, Berhanu Gidisa; Dilla University College of Health Sciences, School of Public Health Sisay W/tsadik, Daniel; Dilla University College of Health Sciences, School of Public Health; Dilla University College of Health Sciences, Ashenafi, Eden; Dilla University College of Health Sciences, Department of Reproductive Health Abebe, Mesfin; Dilla University College of Health Sciences, Department of Midwifery Mamo, Tizalegn ; Dilla University College of Health Sciences, School of Public Health
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Health services research, HIV/AIDS, Infectious diseases, Public health
Keywords:	Chronic Disease, Public health < INFECTIOUS DISEASES, Meta-Analysis, Patient Satisfaction, Health Services

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Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia. A systematic review and meta-analysis

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Abstract

Objective: To make healthcare programs more patient-centred and efficient in light of limited resources, it is crucial to ensure patient satisfaction. There is limited information on the overall level of satisfaction with Human Immunodeficiency Virus/ Acquired Immune deficiency syndromes (HIV/AIDS) treatment and care services in Ethiopia. We conducted a systematic review and meta-analysis of satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people living with HIV/AIDS receiving Antiretroviral Therapy Services (ART) in Ethiopia.

Design: Systematic review and meta-analysis.

Data Source: PubMed, Scopus, Hinari, Web of Science, CINAHL, and Google Scholar were used to locate published studies.

Eligibility Criteria: All observational studies assessing the level of satisfaction with HIV/AIDS care and treatment services and its associated factors among adult people living with HIV/AIDS receiving antiretroviral therapy in Ethiopia were included.

Data extraction and synthesis: Two authors extracted the data using a pre-established data extraction format and exported it to Stata V.17 for analysis. The Cochran's-Q test and I^2 test statistics were used to verify the statistical heterogeneity among included studies. a random-effects meta-analysis model with the Der Simonian-Laird method were used to estimate the pooled effect size of the outcome variables with its 95% confidence interval (CI). Small study effects were assessed using Egger's regression test at a 5% level of significance. A meta-regression analysis and leave-one-out sensitivity analysis were also conducted.

Results: Twenty-four studies were included. The pooled level of satisfaction with HIV/AIDS treatment and care services in Ethiopia was 69.7 (95% CI 63.84, 75.50%). Addis Ababa city administration has the highest (83.9%; 95% CI: 79.90, 87.97%) level of satisfaction, and Southern Ethiopia has the lowest (64.5%; 95% CI: 51.26, 77.83%) level of satisfaction. The included studies measured factors associated with satisfaction with HIV/AIDS care and treatment services differently, making it challenging to pool variables linked to satisfaction. Moreover, this meta-analysis found gender (Adjusted Odds Ratio (AOR) = 1.11, 95% CI: 0.73, 1.69) and residence (AOR = 1.10, 95% CI: 0.72, 1.69) had no significant association with satisfaction with HIV/AIDS care and treatment services.

Conclusions: More than two-thirds were satisfied with HIV/AIDS treatment and care services in Ethiopia. The findings show the presence of regional differences in satisfaction with HIV/AIDS treatment and care services. The finding suggested that policymakers and

healthcare administrators should focus on empowering patients to make treatment decisions, pay attention to areas of service provision that affect HIV/AIDS care and treatment services, and make strategic plans for effective and better-quality services.

Protocol registration number CRD42023438589

Data availability statement: All data relevant to the study are included in the article or uploaded as supplementary information. Extracted data are available on request to the corresponding author.

Keywords: Antiretroviral therapy, Ethiopia, Health facilities, HIV/AIDS care and treatment services, People living with HIV/AIDS, Satisfaction

Strength and limitation of this study

- This systematic review and meta-analysis were registered in the prospective register of systematic reviews (PROSPERO).
- This systematic review and meta-analysis followed Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines to describe the rationale and aims of this study, the methods that were used in identifying studies, and compose the report.
- The study provided up-to-date and comprehensive evidence on adult level of satisfaction with HIV/AIDS care and treatment services in Ethiopia, offering valuable insights for improving healthcare facilities' quality of care.
- The systematic review concentrated on observational studies, primarily cross-sectional, which do not establish a real cause-and-effect relationship between the factors and outcome variables.
- Due to the absence of data in some regions of Ethiopia, including Afar, Benishangul-Gumuz, Gambella, and Somali region, the study's pooled prevalence estimates could not be an accurate representation of the conditions in those regions.

Introduction

The Human Immunodeficiency Virus (HIV), which has killed 40.4 million people worldwide, continues to be a serious global public health problem. The World Health Organisation (WHO) estimates that at the end of 2022, about 39.0 million people living with HIV/ Acquired Immune deficiency syndromes(AIDS)(PLWHA) worldwide, with 25.6 million of them living in the WHO African Region [1]. The number of patients receiving antiretroviral therapy increased from 7.7 million in 2010 to 29.8 million by the end of December 2022. Globally, the use of antiretroviral therapy (ART) has demonstrated impressive results, with a reduction in HIV/AIDS-related deaths and new infections of 45% and 23%, respectively, over the previous ten years [2].

In December 2020, the Joint United Nations Programme on HIV/AIDS (UNAIDS) released a new set of ambitious targets that require 95% of all individuals living with HIV to be aware of their status, 95% of all individuals receiving antiretroviral therapy to be receiving treatment, and 95% of all individuals receiving treatment to have viral suppression by 2025 [3]. Furthermore, UNAIDS set a global goal to end the AIDS epidemic as a threat to public health by 2030, with the three zeros vision: zero deaths, zero new infections, and zero discrimination [3-5]. Despite these international initiatives, low- and middle-income countries (LMICs) still have difficulties ensuring treatment success, adherence to HIV treatment, retention in care, and optimal patient satisfaction [6-8].

In response to the HIV/AIDS epidemic, the Ethiopian government took action as early as 1985. As a result, the Federal Ministry of Health of Ethiopia (FMOH) has been executing a sector-wide reform to raise the standard and accessibility of ART care services in medical facilities across the nation [9]. According to the FMOH, ART program's rapid expansion in Ethiopia has dramatically decreased the number of AIDS-related deaths, with a 52% decrease in AIDS deaths in 2019 compared to the level in 2010. Similarly, of the total 79% of estimated PLHIVs that knew their status during 2019, 90% of them were taking ART of which 91% of them had viral suppression [9] [10]. Thus, the ART program's rapid expansion offered a once-in-a-lifetime chance to quickly scale up HIV/AIDS prevention, care, and treatment services. The expansion of ART access has received much attention, and adherence to treatment plans [11] and virological suppression [12] [13] are important factors that determine ART effectiveness..

Patient satisfaction, which has been widely described as the "cognitive and emotional response to the elements of care delivery and service [14]," is a sign of the quality of medical services and

a significant predictor of overall health outcomes [15-17]. In the medical sector, a key performance and outcome assessment is patient satisfaction with healthcare services. To make healthcare programs more patient-centered and efficient in light of limited resources, it may be helpful to assess how patients rate their care. This will allow for the identification of problems and the development of solutions [18] [19]. To make effective use of the healthcare system's limited resources, it is crucial to ensure patient satisfaction and high-quality care [19]; this is because patient satisfaction reflects the discrepancy between what is expected and received from the services provided [18].

Patient satisfaction is vital for HIV management as it boosts hospital visits, drug adherence, follow-up visits, and reduces disease rates. Satisfied patients adhere better to treatment plans and appointment to follow-up, and seek further advice; evidence shows patient satisfaction has a strong relationship with HIV care retention [8] [20] [21] the quality of health services [22], ART adherence [20] [22], better health outcome, and recommendations of the service to others [23] However, dissatisfied patients may experience non-compliance, opportunistic infections, medication resistance, and negative information, potentially discouraging others from seeking healthcare [24]. Moreover, studies revealed that satisfaction with HIV/AIDS treatment and care services was affected by waiting time to see health care providers [25] [26], the quality of reception services [27], Time to reach health facility [28], the interpersonal and technical abilities of providers [26] [27], problems with accessibility, lack of laboratory services, unclean health restrooms [29], total time spent at health facility, and confidentiality [26].

Even so, there are a few studies that assessed the level of satisfaction and associated variables with HIV/AIDS treatment and care services among PLWHA in Ethiopia; these studies were restricted to a single institution, reported inconsistent and inconclusive findings, and demonstrated significant variation across various periods and geographical locations. The level of satisfaction varies across individual studies in Ethiopia, ranging from 46% in a study conducted in the health facilities of East Showa, Oromia, to 90.8% in studies conducted in Hawassa and Yirgalem[9] [29-33]. Moreover, there is limited evidence that provides a comprehensive understanding of the overall level of satisfaction with HIV/AIDS treatment and care services and its associated factors among PLWHA in Ethiopia. Therefore, we have conducted a systematic review and meta-analysis to pool the level of satisfaction with HIV/AIDS and associated factors by combining data from primary studies. The study's findings could aid healthcare professionals in enhancing service provision, spending, and overall health services,

while also enhancing patient satisfaction with HIV/AIDS treatment, providing evidence to address disparities, and influencing policy decisions.

Materials and methods

Study settings and design

This study was carried out in Ethiopia, a country in north-eastern Africa also referred to as the Horn of Africa, bordered by Kenya, South Sudan, Sudan, Djibouti, Eritrea, and Somalia. Based on the most recent United Nations figures, Ethiopia's population is predicted to be 123,415,729 as of July 16, 2023, placing it second in Africa behind Nigeria [34]. As of August 2023, Ethiopia has two administrative cities (Addis Ababa and Dire Dawa) and twelve regional states. The twelve regional governments are Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Gambella, Harari, Sidama, South West Ethiopia Peoples, and South Ethiopia Region. The last three regions, Sidama, South West Ethiopia Peoples', and South Ethiopia Region, were formerly included in the Southern Nations, Nationalities, and Peoples Region (SNNPR) (Supplementary figure 1). A systematic review and meta-analysis of observational studies were conducted on satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Protocol registration and reporting

The protocol for this systematic review was registered in the prospective register of systematic reviews (PROSPERO) with a registration number of CRD42023438589 on July 16, 2023. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used to guide the protocol of this review to ensure our procedure is reproducible and transparent [35]. The PRISMA-P 2020 guidelines were also used to describe the rationale and aims of our SRMA, the methods that were used in identifying studies (e.g., inclusion criteria), and analytic details [36].

Searching strategy and source of information

Several primary studies on the prevalence of patient satisfaction with HIV/AIDS treatment and care services provided among Ethiopian healthcare facilities were searched and discovered using international online databases (PubMed, Scopus, Hinari, and African journals online), and Google Scholar was manually searched using reference lists of individual studies. No restrictions on the year of publication were applied when searching for published research. The "AND" and "OR" Boolean operators were used to create the search query individually or in

combination using the following keywords: prevalence, patient satisfaction, antiretroviral therapy, health facilities, and Ethiopia. Medical Subject Headings (MeSH) and pertinent keywords related to the research topic were used with other search strategies.

We used search terms "HIV," "AIDS," “HIV/AIDS care and treatment’’, ‘’ART’’," “Patient Satisfaction," "Determinants,” and “Ethiopia” and their synonyms. These were verbalized as per the databases. For instance, the PubMed search strategy we looked at ("patient satisfactio n"[MeSH Terms] OR ("personal"[All Fields] AND "satisfaction"[All Fields]) OR "client satisfaction"[MeSH Terms]) OR "client satisfaction"[All Fields]) OR " treatment experience" [MeSH Terms]) OR " treatment experience"[All Fields]) OR " care satisfaction"[MeSH Terms]) OR " care satisfaction"[All Fields]) AND HIV/AIDS[All Fields] AND ("therapy"[Su bheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "therapeutics"[MeSH Ter ms] OR "therapeutics"[All Fields]) AND care[All Fields] AND "services"[All Fields] AND a ssociated[All Fields] AND factors[All Fields] AND ("adult"[MeSH Terms] OR "adult"[All Fields]) AND ("persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]) AND living[All Fields] AND HIV/AIDS[All Fields] AND ("Ethiopia"[MeSH Terms] OR "Ethiopia"[All Fields]) (Supplementary table 1).

Two independent researchers identified the appropriate studies, while the other researchers settled any disputes. To locate, arrange, and remove duplicate records from the studies found using the search approach, Endnote X7 software was used.

Study selection and process

The **CoCoPop** mnemonics were used to establish inclusion and exclusion criteria for prevalence studies [37]. CoCoPop is composed of: condition (the illness, symptom, prevalence, or associated factors); Context refers to environmental factors, such as the geographic location, region, or time period, that affect the condition's incidence or prevalence; population is a description of the characteristics that define the population. Two researchers independently examined each article in three steps to determine which ones were included: titles, abstracts, and full texts of the remaining articles. The articles that fulfilled the screening were compiled together by two researchers, and disagreements were settled by consensus with the help of the other reviewers. The articles included in this systematic review and meta-analysis, which looked at the proportion of patient satisfaction with HIV/AIDS treatment and care services and its associated factors in Ethiopian health facilities, were chosen based on the criteria listed below.

Inclusion criteria

Outcomes of interest (condition): Articles that reported on the level of patient satisfaction with the HIV/AIDS treatment and care services and its associated factors provided by the healthcare facility.

Population: Adults (people aged 18 years old or older) living with HIV/AIDS receiving antiretroviral therapy.

Study settings (context): Studies conducted only in Ethiopia.

Study design: All types of observational studies (cross-sectional, case-control, and cohort) were included.

Language: The review included only English-language studies.

Publication status: Only published (journal articles) articles without restriction of date of publication were included.

Exclusion criteria

Articles that fail to report the main outcome of interest are excluded. Systematic reviews, brief communications, letters to the editor, comments, full qualitative research, articles that were difficult to access in full (after contacting the authors in question via email to request the complete texts), studies that does not fulfill the eligibility criteria, and duplicate articles were also excluded.

Outcome measurement

For this systematic review and meta-analysis, two primary outcomes were considered. The first outcome was the pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services provided by health facilities in Ethiopia, which was calculated by dividing the number of PLWHA satisfied with HIV/AIDS treatment and care services by the total people living with HIV/AIDS and, then multiplied by 100. The pooled odds ratio (OR) with 95% confidence interval (CI) was used to quantify the extent of the relationship between satisfaction with HIV/AIDS treatment and care services and the factors associated with PLWHA's satisfaction with HIV/AIDS treatment and care services, which was the second outcome. Moreover, variables with difficulty in pooling their effect on satisfaction with HIV/AIDS care and treatment services were reviewed qualitatively.

Data extraction process

All the relevant data was separately gathered by two authors from the primary articles. The data were extracted using a defined data extraction format that was created as a summary table in a Microsoft™ Excel spreadsheet. The data extraction from each abstract and/or full text of

the article that was considered eligible includes the name of the first author followed by initials, region, study area, publication year, study design, study setting, sample size, response rate, and the outcome of interest (prevalence of patient's satisfaction with HIV/AIDS treatment and care services and its determinants). The log odds ratio for every variable was computed using the primary study findings, and data were gathered in the form of a two-by-two table for the second outcome.

Assessment of the quality of the individual studies

To evaluate the quality of the included studies in this systematic review and meta-analysis, the Newcastle-Ottawa (NOS) Scale for cross-sectional study quality assessment was adapted [38]. As recommended by the NOS scale, we evaluated the included research using the following domains: **Domain 1: Selection (5 stars)** included the following factors: representativeness of the sample (1 star), sampling technique (1 star), response rate (1 star), and ascertainment of exposure (2 stars); **domain II: Comparability (2 stars)** included confounding control (data/results adjusted for relevant predictors/risk factors/confounders (2 stars); **domain III: Outcome (3 stars**) included outcome assessment (2 stars) and statistical tests (1 star). Articles with less than five scores indicated low quality, five to seven indicated moderate quality, and more than seven indicated high quality [39] [40]. For this systematic review and meta-analysis, studies having a quality score of moderate or higher were taken into consideration. The quality of the primary studies was evaluated independently by the two authors. Any disagreements that might have arisen between the two authors while evaluating the quality of individual studies were resolved through conversation and with the assistance of the other authors.

Data processing and analysis

The data were exported into STATA/SE version 17 statistical software for analysis after being extracted using a Microsoft Excel spreadsheet. Heterogeneity was assessed using the P-value result of the I^2 statistic and the Cochrane Q-test [41]. A P-value of < 0.10 denotes statistically significant heterogeneity, and values of 25%, 50%, and 75% were used to categorize the heterogeneity result as low, medium, and high, respectively [42] [43]. Therefore, Der Simonian and Laird's pooled effect was calculated using a random effects meta-analysis model. With a 95% confidence interval, the estimated pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services was determined. To investigate differences in the prevalence across studies in the primary pooled analysis, a subgroup analysis was carried out by publication year, study setting, sample size, and research region.

To statistically evaluate publication bias, the Egger weighted regression and Begg's rank correlation test methods were used (a two-sided p-value of ≤ 0.05 was regarded as suggestive of statistically significant publication bias), and the forest plot was also used graphically (visually) represent the presence of heterogeneity [44], based on the presumption that, in the absence of publication bias, the effect sizes of all the studies are normally distributed about the middle of a funnel plot, the trim-and-fill analysis was also performed to evaluate for and correct any publication bias [45]. Univariate meta-regression was used for mapping the potential source of heterogeneity and sensitivity analysis were carried out to evaluate the impact of a single study on the total pooled estimate.

Regarding the second result, an analysis was conducted using OR with 95% CI to evaluate the relationship between factors linked to HIV/AIDS treatment and care services satisfaction and the first outcome. A p-value of less than or equal to 0.05 was used to declare the association as statistically significant at 95% CI. Graphs, tables, texts, and a forest plot were employed to display the anticipated pooled level of satisfaction with HIV/AIDS treatment and care services and its associated factors.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Results

Study selection and identification

We located a total of 9076 articles using electronic searches, which included 1176 articles from databases and 7900 studies from Google Scholar searches. Of the 1176 articles in the database, 283 were left for screening after 893 were eliminated because they were duplicates. Out of 283 articles from database searches, 209 studies were excluded by looking at their titles and abstracts, 49 studies were excluded for not being able to retrieve, and 10 were also excluded due to the outcome not being indicated and poor data quality. Moreover, out of 7900 articles, 7,835 were excluded due to not being retrieved and excluded by title and abstracts from additional sources (Google Scholar), and after the remaining 65 articles were reviewed, 56 articles were excluded due to the outcome not being reported clearly, insufficient data, no full text available, and wrong research population. Finally, 24 eligible studies have been considered in this meta-analysis and systematic review (Figure 1).

Characteristics of the included studies

The 24 articles that were included were all facility-based cross-sectional studies, and they were all published. The number of participants in the included studies ranged from a low of 261 in one study in Dire Dawa, eastern Ethiopia [46], to a maximum of 721 in study done in the Tigray region [29]. This systematic and meta-analysis included 8940 individuals who were 18 years of age or older. In various parts of the nation, the primary studies were published between 2012 and 2024. Two city administrations (Addis Ababa and Dire Dawa) and five regions of Ethiopia were included in this review.

This systematic review and meta-analysis included three studies from Addis Ababa city administration [33 47 48], five from the Amhara region [9 49-52], one from Dire Dawa city administration [46], one from Harari Region [53], five from the Oromia region [30 54-57], seven from southern Ethiopia (by combining studies from Sidama, southeast Ethiopia, and south Ethiopia regional state[11 31 32 58-61], and two from Tigray regional state [29 62]. There were no studies reviewed from Afar, Benishangul Gumuz, Gambella, and Somali regional states of Ethiopia. A study conducted in the Hawassa and Yirgalem hospitals revealed the highest prevalence of satisfaction with HIV/AIDS treatment and care services (90.8%) [32], and a study conducted in the east shoa zone revealed the lowest prevalence (46.2%) [30]. While the majority of the research focused on HIV/AIDS care and treatment in general, three studies focused explicitly on ART laboratory services [32 33 52], and three studies on ART pharmacy services [9 48 50]. When analyzing the study based on the facility in which it was conducted, we found that 14 were from hospitals [9 32 33 46-48 51-53 55 59-62], 7 were from both hospitals and health centers [11 31 50 54 56-58], and 3 were from health centers [29 30 49].

Nearly all studies had a high response rate (> 91.6%), which might be attributable in part to the use of interviewer-administered for data collection. It is also important to note that almost all of the included studies used interview administered structured questionnaires [9 11 29-33 46 48-56 58-60 62] whilst only a handful of them adopted a mixed strategy to collect data i.e. document review and interview [47 57 61], and most used exit interviews to level satisfaction levels (Table 1). Studies that were included which relied highly on exit interviews need to be interpreted with caution because of possible distortions due to social desirability effect and because satisfaction and dissatisfaction may be indicated by patients based on their last experience, and if that experience is emotionally charged by the particular care they received, the results may prove misleading.

Regarding the quality assessment we have used NOS and based on the quality assessment (NOS) score, we found that all research included in this systematic review and meta-analysis had reliable methodological quality, with scores ranging from 6 to 10 out of a possible 10 NOS points ((Supplementary table 2).

Table 1: Characteristics of the studies included in the systematic review and meta-analysis to show the prevalence of patient satisfaction with HIV/AIDS treatment and care services in Ethiopia.

Author name	publication year	Study Area	Study Region	Study Setting	Sample Size	Response rate (%)	Prevalence (95%CI)	Quality Score
Abdissa B et al.[56]	2024	Woliso town	Oromia	Both	361	100	54.6	8
Abebe TB et al.[9]	2022	Gondar university	Amhara	Hospital	291	98.3	54.7	8
Addisu G et al. [49]	2020	Gondar town	Amhara	Health Center	663	100	75.4	10
Atsebeha KG et al.[62]	2018	Shire – Endaslassie	Tigray	Hospital	422	99.5	75.2	10
Badacho AS et al.[58]	2023	Wolaita zone	Southern Ethiopia	Both	615	98.4	70.7	10
Belay M et al.[32]	2013	Hawassa and Yirgalem	Southern Ethiopia	Hospital	422	100	90.8	7
Belete TM et al.[50]	2023	Dembia district	Amhara	Both	308	100	76.95	9
Doyore F et al.[11]	2016	Hossana Town	Southern Ethiopia	Both	301	100	70.1	7
Eshetu A et al.[46]	2013	Dire Dawa	Dire Dawa	Hospital	261	91.6	54.6	6
Gezahegn M et al.[54]	2021	Jimma Town	Oromia	Both	383	100	85.5	9
Girmay A et al.[48]	2020	Addis Ababa	Addis Ababa	Hospital	285	100	78.9	9
Habtamu A et al.[55]	2017	Western Wollega Zone	Oromia	Hospital	266	95.8	57.6	8
Halili A et al.[61]	2024	Hadiya Zone	Southern Ethiopia	Hospital	422	100	53.1	10

Mekonnen T et al.[53]	2021	Harar town	Harari	Hospital	413	98	76.9	10
Mindaye T et al.[33]	2012	Addis Ababa	Addis Ababa	Hospital	422	96.2	85.5	9
Nigussie T et al.[59]	2020	MizanTepi University	Southern Ethiopia	Hospital	356	97.7	55.2	9
Tawiye NY et al.[51]	2021	Dessie	Amhara	Hospital	375	96.5	64.1	10
Tebeje M et al.[52]	2020	Bahirdar	Amhara	Hospital	422	100	53.3	7
Tessema SB et al.[29]	2015	In five zones of Tigray region	Tigray	Health Center	721	99.03	89.6	9
Tiruneh CT et al.[47]	2021	Addis Ababa	Addis Ababa	Hospital	420	100	86.4	8
Uma TH et al.[57]	2024	Woliso Town	Oromia	Both	334	100	81.4	10
Worku G et al.[60]	2020	Dilla town	Southern Ethiopia	Hospital	270	100	65.2	8
Yakob B et al.[31]	2016	Wolaita Zone	Southern Ethiopia	Both	485	99.5	46.4	9
Yilma TA et al.[30]	2021	East Shoa Zone	Oromia	Health Center	398	100	46.2	10

Meta-analysis

level of satisfaction with HIV/AIDS treatment and care services

The level of satisfaction with HIV/AIDS treatment and care services varied significantly across studies, as evidenced by the high and significant heterogeneity among included studies (I^2 = 98.04%, Q = 1175.4, degree of freedom (df) = 23, p-value < 0.01). To estimate the pooled level of satisfaction with HIV/AIDS treatment and care services among people living with HIV/AIDS receiving ART in Ethiopia, a random-effect analysis model was employed. The pooled level of satisfaction with HIV/AIDS treatment and care services in Ethiopia was 68.7% (95% CI: 62.79,74.61%) (Figure 2).

Publication bias

Begg's and Egger's regression tests were used to declare the presence of publication bias objectively, while the presence of possible small study effects was checked by using a funnel plot by visual inspection. The Egger tests (p-value = 0.001) and Beggs tests (p-value = 0.001)

revealed significant publication bias among the included studies. The asymmetrical distribution in a funnel also indicated there are a small-study effects (Figure 3). Thus, to account for this publication bias trim and fill analysis was employed.

Trim and fill analysis

The nonparametric trim-and-fill analysis was employed to estimate the potential number of missing studies by minimising and correcting the publication bias in the studies. Only one study was imputed for missing study during the analysis, and the estimated pooled level of satisfaction with HIV/AIDS treatment and care services among PLWHA in Ethiopia appeared to be 69.7 (95% CI: 63.84,75.50) after accounting for publication bias. This value slightly differs from the unadjusted pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services in the random effect model (Supplementary figure 2).

Sub-group analysis

Subgroup analyses were conducted by study region, and year of publication, and included sample size to identify the potential source of study heterogeneity (Table 2). The subgroup analysis by region revealed that the highest pooled proportions of patient satisfaction with HIV/AIDS treatment and care services were found in the Addis Ababa city administration (83.9%, 95% CI: 79.90, 87.97%; $I^2 = 71.41\%$, $p = 0.03$) and Tigray regional states (82.5, 95% CI: 68.40, 96.62%; $I^2 = 97.25\%$, $p < 0.01$), while the least was found in Southern Ethiopia (64.5%, 95% CI: 51.26, 77.83%; $I^2 = 98.54\%$, $p < 0.01$) (Supplementary figure 3).

A subgroup analysis based on the year of publication was also conducted to ascertain whether patient satisfaction with ART services varied from year to year. We classified the years of publication before 2021 and after 2021 based on the HIV/AIDS national strategic plan for Ethiopia 2021–2025 [63]. Therefore, before and at 2021, the pooled proportion of patients who were satisfied with HIV/AIDS treatment and care services was found to be 68.9% (95% CI: 61.66, 76.26.09; $I^2 = 98.24\%$, p-value < 0.01), the finding showed d that the satisfaction level was roughly the same for each category of the year (Supplementary figure 4).

According to the health facility where the included studies were conducted, the pooled level of satisfaction with HIV/AIDS treatment and care services among studies conducted at the health center was (70.5%, 95% CI: 48.74, 92.26, $I^2 = 99.24$; p-value < 0.01), even though there was significant heterogeneity among health facilities, the pooled level of satisfaction result did not change due to the confidence intervals overlap (Supplementary figure 5).

According to the subgroup analysis by sample size in this meta-analysis, the prevalence of satisfaction with HIV/AIDS treatment and care services was 70.8% (95%CI: 62.71, 78.86; I^2 = 98.7%, p-value < 0.01) in studies with sample sizes greater than 372 (Supplementary figure 6).

Table 2: The pooled estimate of satisfaction with HIV/AIDS treatment and care services among people living with HIV/AIDS, 95% CI, and heterogeneity estimate with a p-value for the subgroup analysis.

Variables	Categories	Included studies	Pooled estimates (95%CI)	Heterogeneity (I^2, p - value)
By region	Addis Ababa	3	83.9% (79.90, 87.97)	71.41%, 0.03
	Amhara	5	64.6% (55.10,74.10)	95.39%, < 0.01
	Eastern Ethiopia	2	65.8% (43.95, 87.65)	97.82%, < 0.01
	Oromia	5	65.1% (49.06, 81.20)	98.37%, < 0.01
	Southern Ethiopia	7	64.5% (51.26,77.83)	98.54%, < 0.01
	Tigray	2	82.5% (68.40, 96.62)	97.25%, < 0.01
By publication year	≤ 2021	17	68.9% (62.79, 76.26)	98.24%, < 0.01
	> 2021	7	68.0% (57.71,78.38)	97.56, < 0.01
By study setting	Hospital	14	68.1% (64.24,75.89)	97.84, < 0.01
	Health Center	3	70.5% (48.74,92.26)	99.24. < 0.01
	Both	7	69.14% (58.66,79.62)	97.59, < 0.01
By sample size (mean)	≤ 372	15	65.7% (59.13,72.40)	94.14%, < 0.01
	> 372	5	70.8% (62.71,78.86)	98.58%, < 0.01

Meta-regression

In order to identify the specific reasons for the observed differences among studies, a meta-regression analysis was conducted. Sample size, quality of study, response rate, and publication year were all included as a covariate in the meta-regression analysis. However, the meta-regression analysis result showed that there was no statistically significant heterogeneity among included studies (Supplementary table 3).

Sensitivity analysis

The random effects model revealed no single study significantly impacted patient satisfaction with ART services, with no point estimates exceeding the 95% confidence interval (Supplementary figure 7).

Factors associated with satisfaction with HIV/AIDS treatment and care services

This section qualitatively examined the majority of the variables related to satisfaction with HIV/AIDS care and treatment services in Ethiopia. Overall, we found that most of the studies varied in their degree of adjustment for potential confounding variables that influence the likelihood of satisfaction with HIV/AIDS care and treatment services. Moreover, there was variability in the assessment of the relationship between factors and satisfaction with HIV/AIDS care and treatment services (i.e., factors were measured differently across studies as potential factors for satisfaction with HIV/AIDS care and treatment services). Because of this, it was challenging to pool and present the pooled effects of the majority of the variables linked to satisfaction with HIV/AIDS care and treatment services in Ethiopia.

Socio demographic factors

Nearly every included study evaluates and analyses sociodemographic aspects; depending on each factor, we attempt to qualitatively review and quantitatively analyze those studies. Eleven Ethiopian studies that were part of this systematic review and meta-analysis examined the relationship between marital status and satisfaction with HIV/AIDS care and treatment services. The association between marital status and satisfaction with HIV/AIDS care and treatment services was statistically nonsignificant in seven out of eleven studies [30 48-51 54 58]. Despite using different reference groups, four studies indicated a statistically significant relationship between marital status and satisfaction with HIV/AIDS care and treatment services [29 52 60 62]. The study's findings indicated that married participants were more likely to be satisfied with the HIV/AIDS care and treatment services than unmarried participants [52 60 62]. Nonetheless, one study found that single participants were more likely to be satisfied with HIV/AIDS care and treatment services than widowed participants [29]. The association between gender and satisfaction with HIV/AIDS care and treatment services was evaluated in eight included studies; six of these studies found no significant relationship between gender and satisfaction [29 30 48 49 51 58]; only two studies [60 61] found a statistically significant relationship between gender and satisfaction with HIV/AIDS care and treatment services. Significant heterogeneity between studies was found using the random effects model estimate. According to the random effect

model estimate, there is no significant association between gender and satisfaction with HIV/AIDS care and treatment services (Adjusted Odds Ratio (AOR) = 1.11, 95% CI: 0.73,1.69; $I^2 = 78.42\%$, p-value <0.01) (Supplementary figure 8).

Twelve studies examined the relationship between age and satisfaction with HIV/AIDS care and treatment services; eight of these studies found no significant relationship between age and satisfaction with these services [29 30 48 50 54 58-60], while four studies found a significant relationship between age and satisfaction [47 49 51 62]. Results from the research [62] indicated that the 36–45 age group is more likely to be satisfied than the 18–25 age group. This is consistent with findings from studies [47 49 51], which also showed that patients over 35 years old were linked to higher levels of satisfaction with HIV/AIDS care and treatment services. Six studies evaluated the association between place of residence and satisfaction with HIV/AIDS care and treatment services; two of these studies [29 51] found a statistically significant relationship, while four of the studies found no significant relationship. The pooled effect of these six studies showed residence of the participants had no significant association with satisfaction with HIV/AIDS care and treatment services (AOR = 1.10, 95%CI: 0.72,1.69; I^2 =66.19%, p-value < 0.01) (Supplementary figure 9).

In Ethiopia, 15 included studies evaluated the relationship between educational status and satisfaction with HIV/AIDS care and treatment services. Of these, seven studies' results explained the non-significant relationship between educational status and satisfaction with HIV/AIDS care and treatment services [30 47-50 54 58], and eight studies explained the significant relationship between educational status and satisfaction with HIV/AIDS care and treatment services [11 29 51-53 56 59 60]. Even though the predictor variables came in different categories, five studies[11 51 56 59 60] found that individuals who had completed primary school, and more were more satisfied with HIV/AIDS care and treatment services than those who had no education, were illiterate, or were unable to read and write. The remaining three studies [29 52 53], however, found that those who were illiterate, no formal education, or did not read and write were more satisfied with HIV/AIDS care and treatment services than those who were literate, college-educated, or above.

Length of stay with ART treatment and satisfaction with HIV/AIDS treatment and care services

Six of the 24 included studies examined the relationship between the duration of ART treatment and satisfaction with HIV/AIDS care and treatment. Despite varying levels of variable

categories, four studies found a statistically significant relationship between satisfaction with HVI/AIDS care and treatment and the length of ART treatment. In one study, participants who had been on ART for more than four years reported higher levels of satisfaction with HIV/AIDS care and treatment [53]. According to one study, participants who had been on ART for more than four years were less likely to be satisfied with the care and treatment they received for HIV/AIDS [54]. According to two studies, individuals with HIV/AIDS who had been receiving ART for longer than two years were more likely to be satisfied with the care and treatment they received [47] [59]. However, the other two studies reported a statistically non-significant relationship between satisfaction with HVI/AIDS care and treatment and the length of ART treatment [30] [49].

Waiting time and satisfaction with HIV/AIDS treatment and care services

To determine whether waiting time and satisfaction with HIV/AIDS treatment and care services are associated, six included studies were reviewed. There is no statistically significant relationship between waiting time and satisfaction with HIV/AIDS treatment and care services, according to one study [55], while five [48] [51] [53] [54] [56] of the six studies found a statistically significant association between waiting time and satisfaction that have different levels of waiting time categories. Based on the results of those studies, one study indicated that those who had to wait 30 to 60 minutes to receive treatments were less likely to be satisfied with HIV/AIDS treatment and care services than people who had to wait less than 15 minutes [54]. Similarly, three studies[51] [53] [56] found that waiting times under 30 minutes were more likely to result in satisfaction with HIV/AIDS treatment and care services than waiting times over 30 minutes. Additionally, another study found that shorter waiting times were associated with the highest likelihood of satisfaction with HIV/AIDS treatment and care services [48].

Discussion

Patient satisfaction plays a crucial role in assessing the level of service quality provided by healthcare professionals [64] [65]. Assessment of patient satisfaction can also help identify unmet patient needs and targeted interventions, improve the performance of health services, a nd predict adherence [20] [22] and treatment outcomes [17].

In this systematic review and meta-analysis, the pooled level of satisfaction with HIV/AIDS treatment and care services among adult people living with HIV/AIDS in Ethiopia among studies published between 2012 and 2024 was 68.7% (95% CI: 62.79,74.61%). However, the estimated prevalence rate was changed to 69.7 (95% CI 63.84, 75.50) following modification with the trim and fill analysis due to publication bias. This result is comparable with studies conducted in Nigeria, which ranges 67.5-77.0% [8] [66-68], Uganda, which is 64.2% [69], Spain, which is 71.9% [70], and China, where 67.1% of the participants said they were very satisfied with the HIV care service [71].

The findings of this systematic review and meta-analysis were higher compared with the results of studies conducted in Vietnam, where 42.4% of patients reported being satisfied with all elements of their HIV/AIDS care [72], studies carried out at various Nigerian health facilities, where it was discovered that patient satisfaction with ART services ranged from 46.9% to 52% [73] [74], a study conducted in Ukraine, where 55.6% of the patients reported being satisfied with their HIV/AIDS care [75], and a study conducted in Pakistan, in which 57.7% of people living with HIV/AIDS attending the HIV/AIDS clinic were satisfied with the health care services [76]. The disparity might also be due to variations in the clinical, socio-demographic, or psychological characteristics of the patient. Furthermore, there is no globally accepted definition of patient satisfaction or measuring methodology, which led to varied results [23].

This finding was lower than the African Cohort Study (AFRICOS), a prospective observational study conducted at PEPFAR-supported clinics in four African countries, in which 89.6% of PLWHIV reported being satisfied with their care [77]. This finding was also lower than a study done in Tanzania (92.3%) [78], five Gert- Sibande district hospitals in South Africa (98%) [79], Cameroon (91.2%) [80], India (92.6%) [25], a study done in Brazil that divided the service into decentralized facilities (a central hospital) and decentralized health units, where patient satisfaction with HIV/AIDS health services was 81% and 86%, respectively [22], with another Brazilian study in which 96.7% of individual satisfied with healthcare services after three

months of initiation of antiretroviral therapy [81], and with a study conducted in Russia, where 86% of the sample reported a high degree of satisfaction with HIV care delivery [82].

The possible justification for low level of satisfaction in the study setting might be due to poor health services provision, service quality, peer support system, communication and information dissemination, work environment arrangements, and integration of mental health services into HIV care services. Furthermore, the use of diverse data collection methods may be the reason for the potential discrepancy between previous studies. The current study findings may be influenced by primary studies' use of interview-administered data collection methods, mainly exit interviews, which may result in biased results due to patients' recent experiences and the pressure to give positive feedback from healthcare professionals, potentially inflating satisfaction ratings [83]. Assessing patient satisfaction with medical treatments is crucial for identifying unmet client needs. Therefore, strengthening support networks and enhancing the quality of care can increase patient satisfaction with HIV/AIDS treatment and care services [84].

Regional variations in patient satisfaction with HIV/AIDS treatment and care services were observed in the subgroup analysis. The results showed that the Addis Ababa city administration, with 83.9% (95% CI: 79.90, 87.97%), and the Tigray region with 82.5%, (95% CI: 68.40, 96.62%), respectively, had the highest proportions of patient satisfaction with HIV/AIDS treatment and care services. While the lowest were in Oromia and Southern Ethiopia, both at 65.8% (95% CI: 49.06, 81.20%) and 64.5% (95% C I: 51.26, 77.83%), respectively. Differences in diagnostic facilities, service provision, the availability and accessibility of free medications, and the number of qualified and sufficient health professionals may all contribute to regional variations in the degree of satisfaction with HIV/AIDS treatment and care services [85]. Variations in the quality of the data from the primary studies, the methods employed to assess the level of satisfaction with HIV/AIDS treatment and care services, and the number of included studies in the subgroup may result in different pooled results, for example, in this review, the subgroups of Oromia and the Southern region of Ethiopia had the most primary studies but the lowest pooled results.

Besides sociodemographic characteristics, satisfaction with HIV/AIDS care and treatment ser vices was related to waiting times and the duration of receiving care. Despite factors being measured differently among primary studies, PLWHA were more likely to be satisfied with HIV/AIDS care and treatment services if they had received care and treatment for a longer duration and had lower waiting times. A literature review on patient satisfaction with antiretroviral treatment services supported these findings [86]. A possible explanation for the

reason why patients who have been on antiretroviral therapy (ART) for a longer time may be more satisfied with HIV/AIDS treatment and care services might be due to having had more opportunities to interact with peer support groups and counseling, which can help them develop better-coping mechanisms and mental health. Additionally, longer ART engagement denotes constant care, which promotes stability and dependability within the healthcare system [87] [88]. Short waiting times for HIV/AIDS treatment and care services lead to increased patient satisfaction, reduced anxiety, improved efficiency, better continuity of care, enhanced engagement, and better time management [89].Consistent with research showing that while time spent in a medical facility is a significant factor in patient satisfaction [90] [91]. The research highlights the importance of wait time reduction as a top priority in the healthcare facility because long wait times might hinder patients from keeping appointments, which can result in default and nonadherence to treatments [91].

Strength and limitation of the study

The strength of this systematic review and meta-analysis was it was registered in the PROSPERO, followed Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines to compose the report, and provided up-to-date and comprehensive evidence on adult level of satisfaction with HIV/AIDS care and treatment services in Ethiopia, offering valuable insights for improving healthcare facilities' quality of care.

There may be some limitations to this study which are due to the absence of data in some regions of Ethiopia, including Afar, Benishangul-Gumuz, Gambella, and Somali region, the study's pooled prevalence estimates could not be an accurate representation of the conditions in those regions. Due to the high sensitivity of Cochran's Q test to the small number of studies included in the meta-analysis, our overall estimations revealed significant heterogeneity among studies, which may indicate that careful interpretation of the results is essential. Methodologi cal discrepancies between primary studies might lead to disparities in effect sizes and results, making it more difficult to synthesize data. Not every possible aspect that could have affected satisfaction was covered in the included articles. The systematic review concentrated on observational studies, primarily cross-sectional, which do not establish a real cause-and-effect relationship between the factors and outcome variables. Despite being an issue in any meta-analysis, publication bias was found in the pooled estimates. Furthermore, NOS does not evaluate statistical power or publication bias.

Practical implications of the study

The following are some of the practical implications of the study on the level patient satisfaction and its associated factors with HIV/AIDS treatment and care services in Ethiopia: Identifying factors that impact patient satisfaction might help policymakers and health care providers to identify gaps in the provision of ART services, which includes improving the quality of services, reducing the waiting time, and ensuring the facilities have adequate stocks of the drugs. Achieving patient adherence to ART is critical to viral load suppression and health outcomes, and healthcare systems can improve adherence by resolving the issues of patient dissatisfaction. The findings can help develop better patient-centered care approaches. The evidence can help policymakers in identifying areas that require patient satisfaction interventions, resource allocation, and arguing for additional funding for the HIV/AIDS programs. The research could underscore the importance of engaging patients and community members in making decisions related to their care. The findings will be helpful when conducting further research on some areas of HIV/AIDS management that satisfy the patient's needs. Furthermore, the evidence obtained from this study can not only be useful in the Ethiopian region but also for cross-cultural and cross-national comparisons of the level of patient satisfaction and its related factors in low- and middle-income countries. Finally, there is potential for improving the quality of care and the measured health outcomes necessary to enhance the global response to HIV/AIDS.

Conclusion and recommendations

More than two-thirds (69.67 %) of the PLWHA in this systematic review and meta-analysis were satisfied with HIV/AIDS treatment and care services provided in Ethiopia. There were regional differences in patient satisfaction with ART services, with the Addis Ababa city administration having the highest rates and the Oromia region having the lowest. The review's sociodemographic characteristics were the most varied. There was inconsistency in the directions and magnitude of the relationships with the level of patient satisfaction, waiting times, and duration with antiretroviral therapy treatment, which was not significantly associated with the level of satisfaction with HIV/AIDS care and treatment services.

Therefore, the findings allow healthcare providers to identify service factors that are necessary to improve patient satisfaction in HIV/AIDS treatment and care. These factors include improving the physical environment, giving patients more control over their treatment, increasing access to medical personnel, equipment, and laboratory services, and overall

contributing to improved quality of life among PLWHA, adherence to ART, and retention in HIV care services.

To reduce HIV-related mortality, it is advised that in addition to increasing the number of patients receiving treatment, policymakers and healthcare organizations should pay attention to aspects of service provision that may have an impact on patient satisfaction, and to make strategic plan for effective and better-quality services. It was suggested that waiting periods be reduced in order to create an environment that improves patient-physician interactions and promotes good treatment outcomes. Furthermore, due to the factors influencing patient satisfaction with HIV/AIDS care and treatment being multifaceted, more research is needed to identify additional factors, especially from the perspective of the patient, and investigate facility-specific strategies to improve the quality of HIV/AIDS care. Future studies ought to consider using mixed methods or triangulating data collection approaches to provide a more thorough understanding of patient satisfaction with ART services in Ethiopia so that policies and practices can be improved.

Abbreviations

ART: Antiretroviral Therapy, **AOR**: Adjusted Odds Ratio; **AIDS**: Acquired Immunodeficiency Syndrome, **CI**: Confidence Interval, **FMOH:** Federal Minister of Health, **HIV**: Human Immunodeficiency Virus, **UNAIDS**: Joint United Nations Programme on HIV/AIDS, **PLWHA**: People living with HIV/AIDS, **PROSPERO**: Prospective Register of Systematic Reviews, **PRISMA**: Preferred Reporting Items for Systematic Reviews and Meta-Analyses, **WHO**: World Health Organization.

Declarations

Ethical approval and consent to participate

Not applicable

Consent for publication

Not applicable

Data availability statement

All data relevant to the study are included in the article or uploaded as supplementary information. Extracted data are available on request to the corresponding author.

Funding

This study was financially supported by Dilla University. However, the funder had no role in the design, data extraction, analysis, and interpretation of the data, in writing the manuscript, or in the decision to submit it for publication.

Competing interests

The authors have declared that no competing interests exist.

Authors contribution's

HEH is responsible for the overall content as a guarantor. **HEH** and **BGD** conceptualized the original draft, prepared it, and developed the methodology, statistical analysis, and tool development. **ZA, DS, EA, MA,** and **TTM** participated in the investigation, software validation, statistical analysis, and manuscript preparation. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

Acknowledgments

We would like to thank Dilla and Addis Ababa University, Ethiopia, for providing free access to the online library so that you can browse the electronic databases.

Supplementary file

Supplementary Table 1. Database and google scholar searching items and results.

Supplementary Table 2. Quality assessment of included studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis.

Supplementary Table 3. Meta-regression analysis result.

Supplementary figure 1. Ethio map.

Supplementary figure 2. Trim and fill analysis result.

Supplementary figure 3. Sub-group analysis by region.

Supplementary figure 4. Sub-group analysis by publication year.

Supplementary figure 5. Sub-group analysis by sample size.

Supplementary figure 6. Sensitivity analysis.

Supplementary figure 7. The association between gender and satisfaction with HIV/AIDS treatment and care service.

Supplementary figure 8. The association between residence and satisfaction with HIV/AIDS treatment and care service.

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Figure legend

Figure 1: PRISMA flowchart of the study selection and identification process on Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Figure 2: A forest plot showing the pooled prevalence of Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Figure 3: Funnel plot displaying the publication bias of studies reporting the pooled prevalence of satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

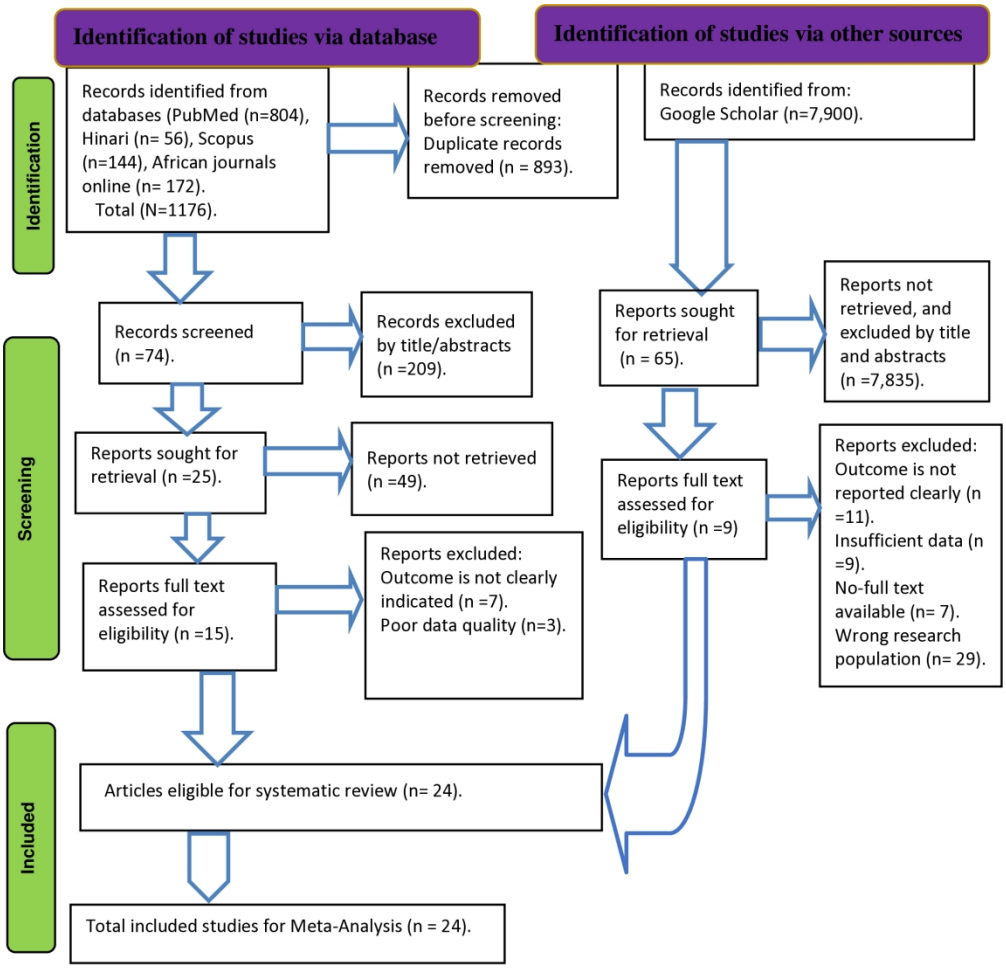


Figure 1: PRISMA flowchart of the study selection and identification process on satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

181x203mm (300 x 300 DPI)

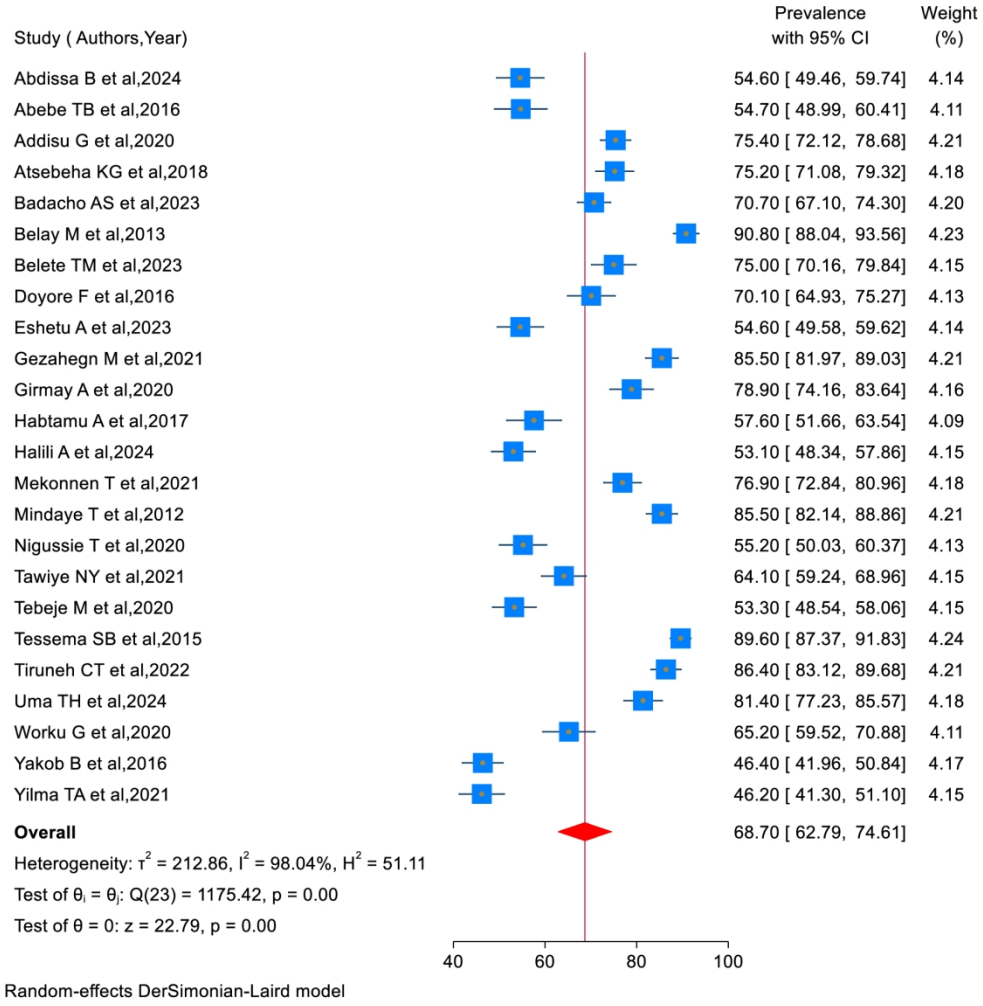


Figure 1: A forest plot showing the pooled prevalence of Satisfaction with HIV/AIDS care treatment and services in Ethiopia

164x180mm (300 x 300 DPI)

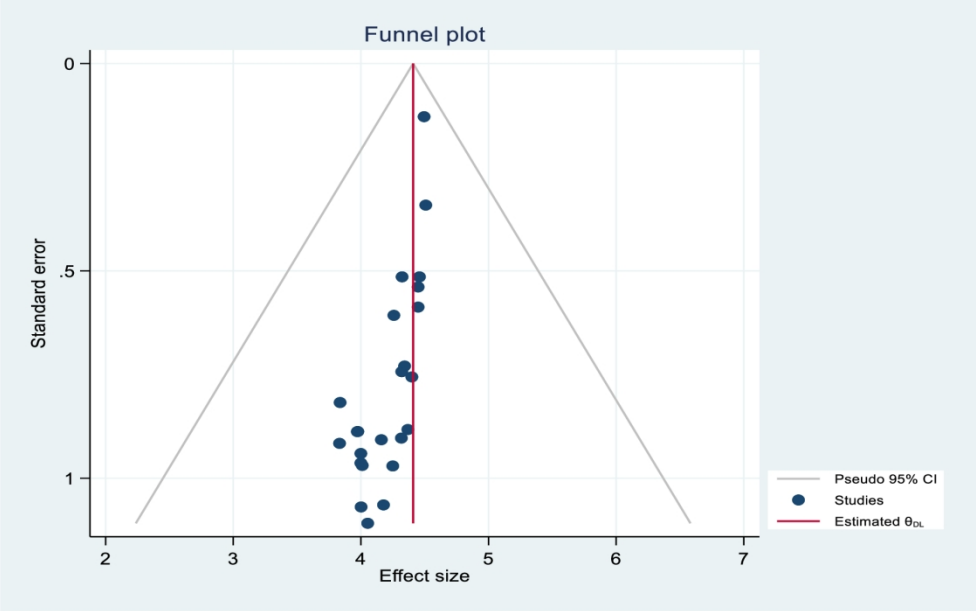


Figure 1: funnel plot displaying the publication bias of studies reporting the pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services in Ethiopia.

166x117mm (300 x 300 DPI)

Supplementary table 1. Databases and google scholar search results for assessing level of satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Databases	Searching terms	Number of studies
PubMed	("patient satisfaction"[MeSH Terms] OR ("personal"[All Fields] AND "satisfaction"[All Fields]) OR "client satisfaction"[MeSH Terms]) OR "client satisfaction"[All Fields]) AND HIV/AIDS[All Fields] AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields]) AND care[All Fields] AND "services"[All Fields] AND associated[All Fields] AND factors[All Fields] AND ("adult"[MeSH Terms] OR "adult"[All Fields]) AND ("persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]) AND living[All Fields] AND HIV/AIDS[All Fields] AND "Ethiopia"[MeSH Terms] or "Ethiopia"[All Fields] * OR "Addis Ababa*"[tw] OR "Dire Dawa*"[tw] OR "east Ethiopia*"[tw] OR "Harari Region*"[tw] OR "Somali Region*"[tw] OR "northeast Ethiopia*"[tw] OR "north Ethiopia*"[tw] OR "Tigray Region*"[tw] OR "Afar Region*"[tw] OR "northwest Ethiopia*"[tw] OR "west Ethiopia*"[tw] OR "southwest Ethiopia*"[tw] OR "South West Ethiopia Peoples' Region*"[tw] OR "Southern Nations, Nationalities, and Peoples' Region*"[tw] OR "Sidama Region*"[tw] OR "Oromia Region*"[tw] OR "Gambela Region*"[tw] OR "Benishangul-Gumuz Region*"[tw] OR "Amhara Region*"[tw] OR "southeast Ethiopia*"[tw] OR "south Ethiopia regional state*"[tw].	804
Google scholar	"Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	7900
From other databases	Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	372
Total article retrieved		9076
Number of included studies		24

Supplementary table 3: Univariate meta-regression analysis to identify possible source of heterogeneity among the included studies.

Source of heterogeneity	Coefficients	Standard error	95% CI	I^2(%)	P - value
Publication year	-1.045	0.828	-2.67, 0.58	97.71	0.207
Sample size	0.031	0.026	-0.02, 0.08	97.85	0.222
Response rate	0.456	2.348	-4.12, 5.04	98.13	0.845
Quality of included study	1.328	2.658	-3.89, 6.54	98.13	0.617

(Supplementary table 2). Quality assessment of studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis of satisfaction with HIV/AIDS treatment and care services and its associated factors among people living with HIV/AIDS in Ethiopia.

	Selection (5 stars)				**Comparability (2 stars)**	**Outcome (3 stars)**		
Author name	Representativeness of the sample (*)	Sample size (*)	Non-respondents (*)	Ascertainment of the exposure (**)	Confounding factors controlled (**)	Assessment of outcome (**)	Statistical test (*)	Total quality score (**10*)**
Abdissa B et al	-	-	-	**	**	**	*	******** (7)
Abebe TB et al.	*	*	*	-	**	**	*	******** (8)
Addisu G et al.	*	*	*	**	**	**	*	********* (10)
Atsebeha KG et al.	*	*	*	**	**	**	*	*********(10)
Badacho AS et al.	*	*	*	**	**	**	*	*********(10)
Belay M et al.	-	*	*	*	**	*	*	*******(7)
Belete TM et al.	*	*	*	*	**	**	*	********* (9)
Doyore F et al.	-	*	*	*	*	**	*	*******(7)
Eshetu A et al.	*	*	-	*	*	*	*	*******(6)
Gezahegn M et al.	*	*	*	*	**	**	*	********* (9)
Girmay A et al.	*	*	*	*	**	**	*	********* (9)
Habtamu A et al.	*	*	-	*	**	**	*	******** (8)

Halili A et al.	*	*	*	**	**	**	*	*********(10)
Mekonnen T et al.	*	*	*	**	**	**	*	*********(10)
Mindaye T et al.	*	*	*	**	**	*	*	*********(9)
Nigussie T et al.	*	*	*	*	**	**	*	*********(9)
Tawiye NY et al.	*	*	*	**	**	*	*	*********(10)
Tebeje M et al.	*	*	*	*	-	**	*	*******(7)
Tessema SB et al.	*	*	*	*	**	**	*	*********(9)
Tiruneh CT et al.	*	*	-	*	**	**	*	********(8)
Uma TH et al.	*	*	*	**	**	**	*	*********(10)
Worku G et al.	-	*	-	**	*	**	*	********(8)
Yakob B et al.	*	*	*	*	**	**	*	*********(9)
Yilma TA et al.	*	*	*	**	**	**	*	*********(10)

Descriptions of quality measurement adapted for cross sectional study

Selection: (Maximum 5 stars or 5 points)

1) Representativeness of the sample:

a) Truly representative of the average in the target population. * (all subjects or random sampling): **1 point**

b) Somewhat representative of the average in the target population. * (non-random sampling): **1 point**

c) Selected group of users: **0**

d) d) No description of the sampling strategy: 0

2) Sample size:

a) Justified and satisfactory: **1 point**

b) Not justified: **0**

3) Non-respondents:

a) Comparability between respondents and non-respondents' characteristics is established, and the response rate is satisfactory: **1 point**

b) The response rate is unsatisfactory, or the comparability between respondents and non-respondents is unsatisfactory: **0**

c) No description of the response rate or the characteristics of the responders and the non-responders: **0**

4) Ascertainment of the exposure (risk factor):

a) Validated measurement tool: **(2points)**

b) Non-validated measurement tool, but the tool is available or described: (**1 point)**

c) No description of the measurement tool. **0**

Comparability: (Maximum 2 stars or 2 points)

1) The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled.

a) The study controls for the most important factor (select one): 1 point

b) The study control for any additional factor: 1 point

Outcome: (Maximum 3 stars or points)

1) Assessment of the outcome:

a) Independent blind assessment: **2 points**

b) Record linkage: **2 points**

c) Self-report: **1 point**

d) No description: **0**

2) Statistical test:

a) The statistical test used to analyse the data is clearly described and appropriate, and the measurement of the association is presented, including confidence intervals and the probability level (p value): **1 point**

b) The statistical test is not appropriate, not described or incomplete. **0**

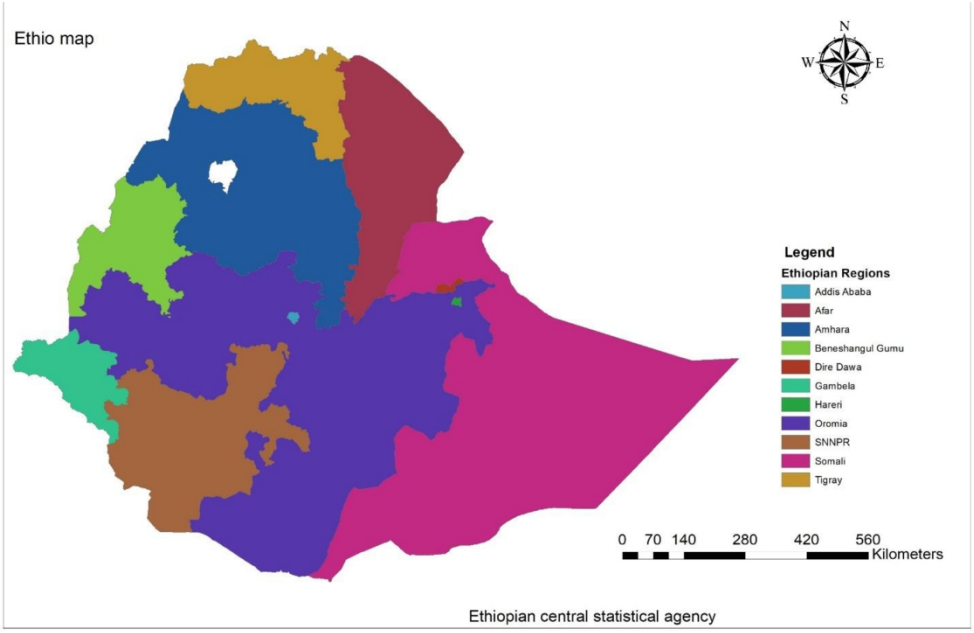
Note: 1 asterisk or star (*) is equivalent to 1 point

Decisions of on the quality of the studies were based on the sum or total score:

- **High quality studies: 7-10 points**
- **Low quality studies: 0-6 points**

Reference:

1. Modesti PA, Reboldi G, Cappuccio FP, et al. Panethnic differences in blood pressure in Europe: a systematic review and meta-analysis. PLoS One. 2016;11(1): e0147601.
2. Ssentongo P, Ssentongo AE, Heilbrunn ES, Ba DM, Chinchilli VM. Association of cardiovascular disease and 10 other pre-existing comorbidities with COVID-19 mortality: A systematic review and meta-analysis. PLOS ONE. 2020;15(8): e0238215.



Supplementary figure 1. The Ethiopian map divided by regions (Source: Central statistical agency).

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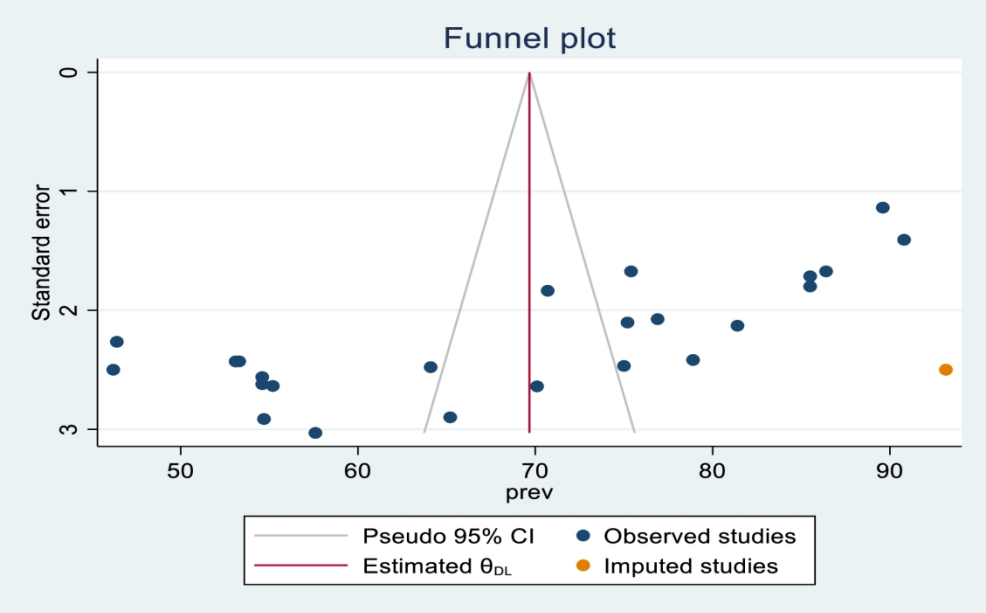
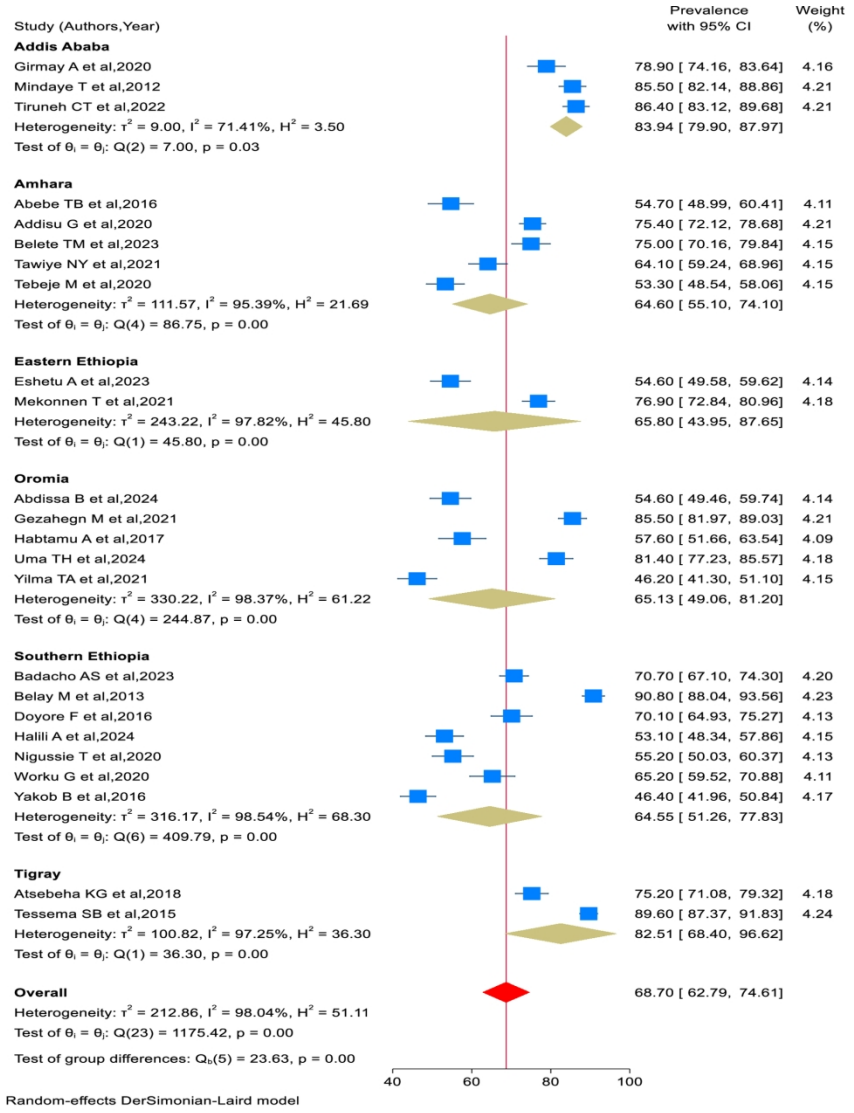


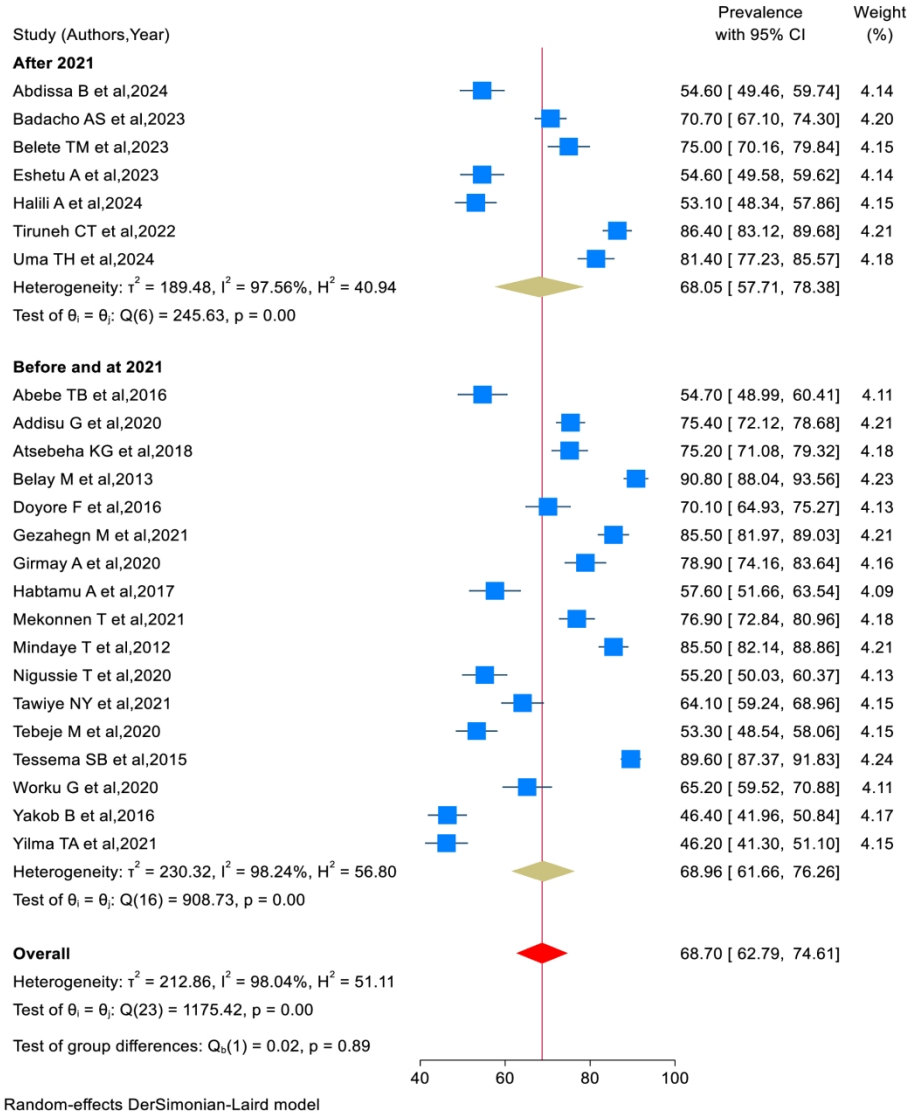
Supplementary figure 2. The plot of trim-and-fill analysis for correcting publication bias of 24 studies.

165x118mm (300 x 300 DPI)



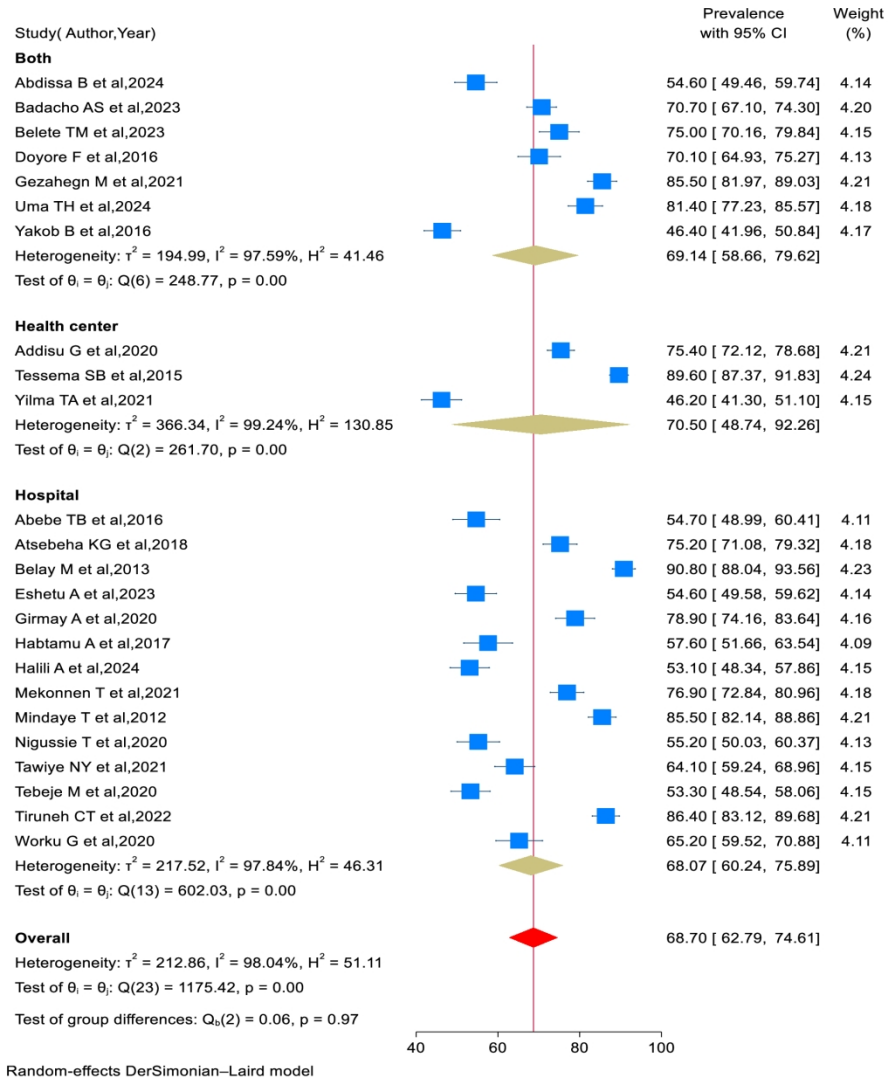
Supplementary figure 3. Forst plot showing subgroup analysis by region for the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

164x222mm (300 x 300 DPI)



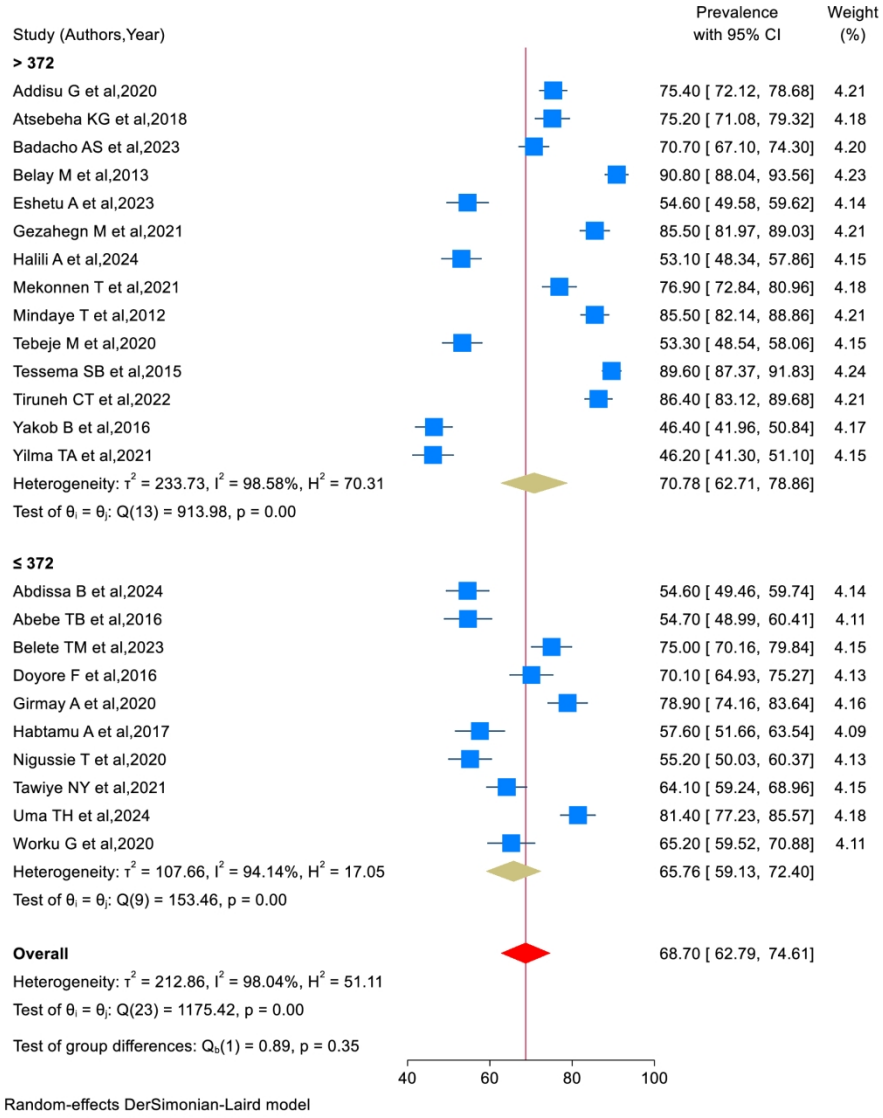
Supplementary figure 4. Forest plot showing subgroup analysis by year of publication to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x212mm (300 x 300 DPI)



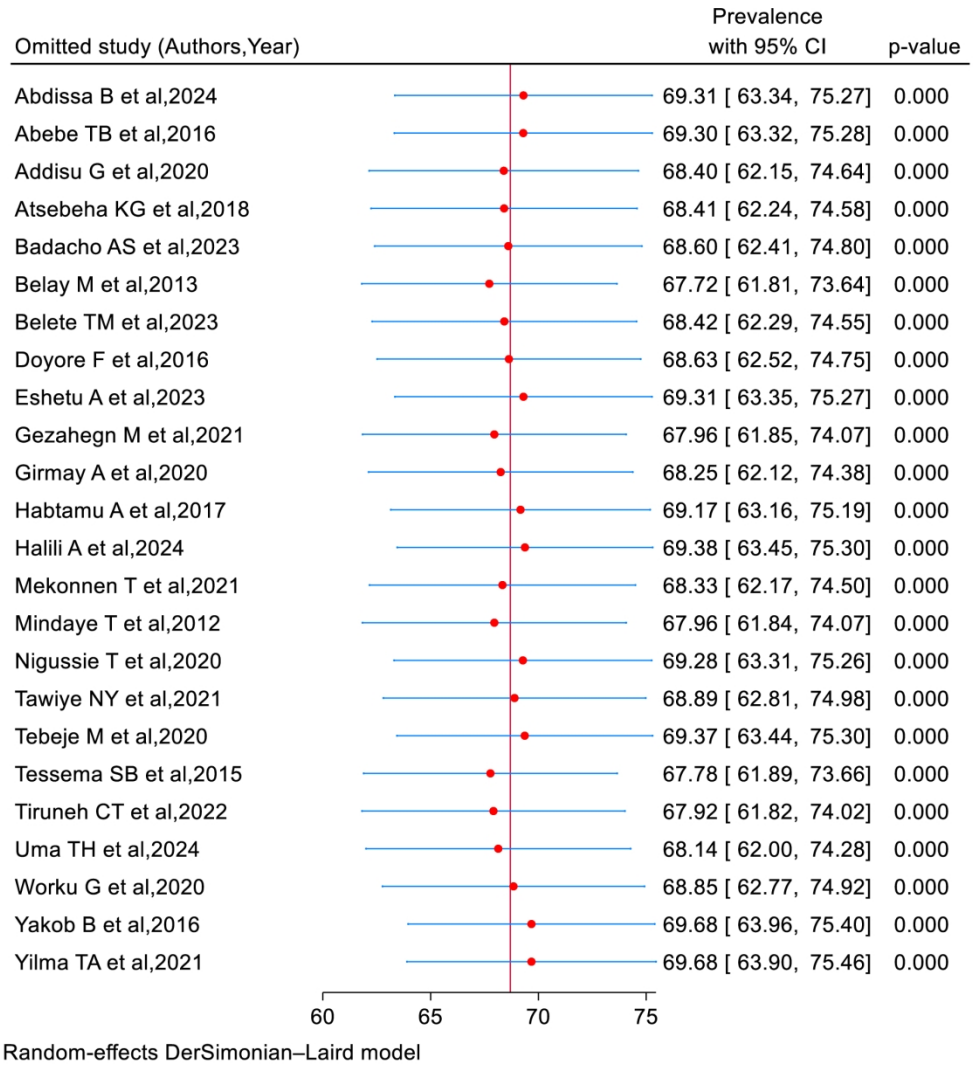
Supplementary figure 5. Forest plot showing subgroup analysis by Study setting included to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x219mm (300 x 300 DPI)



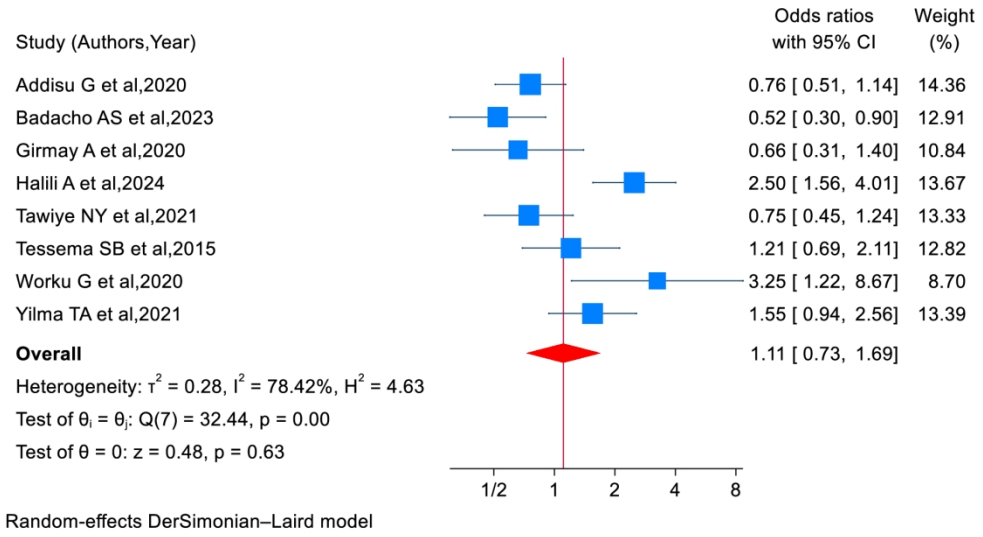
Supplementary figure 6. Forest plot showing subgroup analysis by sample size included to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x212mm (300 x 300 DPI)



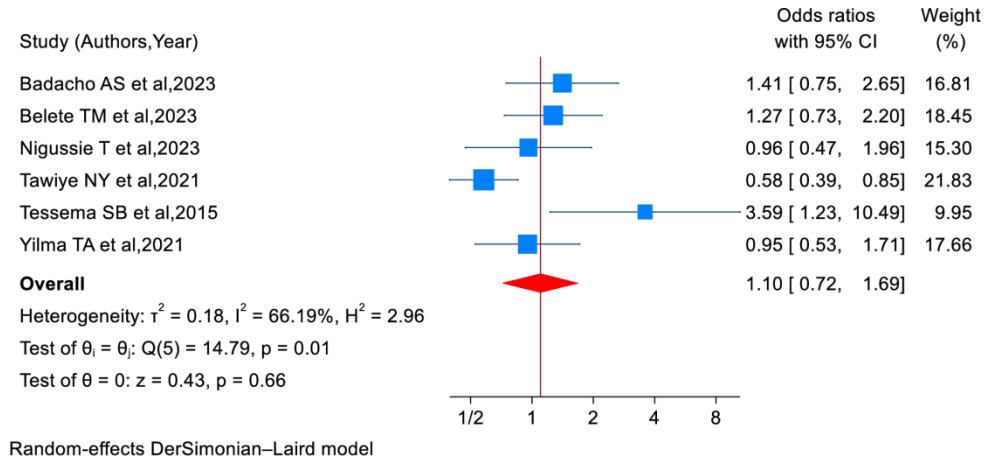
Supplementary figure 7. Sensitivity analysis of the prevalence of patient satisfaction with HIV/AIDS treatment and care services for each study being removed at a time: prevalence and 95% confidence level.

165x199mm (300 x 300 DPI)



Supplementary figure 8. The association between gender and Satisfaction with HIV/AIDS care and treatment services.

165x104mm (300 x 300 DPI)



Supplementary figure 9. The association between residence and Satisfaction with HIV/AIDS care and treatment services.

164x90mm (300 x 300 DPI)

BMJ Open

Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia. A systematic review and meta-analysis

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-085169.R2
Article Type:	Original research
Date Submitted by the Author:	20-Jan-2025
Complete List of Authors:	Hareru, Habtamu; Dilla University College of Health Sciences, School of Public Health Ashuro, Zemachu; Dilla University College of Health Sciences, Department of Environmental health Debela, Berhanu Gidisa; Dilla University College of Health Sciences, School of Public Health Sisay W/tsadik, Daniel; Dilla University College of Health Sciences, School of Public Health; Dilla University College of Health Sciences, Ashenafi, Eden; Dilla University College of Health Sciences, Department of Reproductive Health Abebe, Mesfin; Dilla University College of Health Sciences, Department of Midwifery Mamo, Tizalegn ; Dilla University College of Health Sciences, School of Public Health
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Health services research, HIV/AIDS, Infectious diseases, Public health
Keywords:	Chronic Disease, Public health < INFECTIOUS DISEASES, Meta-Analysis, Patient Satisfaction, Health Services

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Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia. A systematic review and meta-analysis

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Abstract

Objective: To make healthcare programs more patient-centred and efficient in light of limited resources, it is crucial to ensure patient satisfaction. There is limited information on the overall level of satisfaction with Human Immunodeficiency Virus/ Acquired Immune deficiency syndromes (HIV/AIDS) treatment and care services in Ethiopia.

Design: Systematic review and meta-analysis.

Data Source: PubMed, Scopus, Hinari, African journals online, and Google Scholar were used to locate published studies.

Eligibility Criteria: Observational studies assessing the level of satisfaction with HIV/AIDS care and treatment services and its associated factors among adult people living with HIV/AIDS receiving antiretroviral therapy in Ethiopia were included.

Data extraction and synthesis: Two authors extracted the data using a pre-established data extraction format and exported it to Stata Version 17 for analysis. The Cochran - Q and I^2 test statistics were used to measure the statistical heterogeneity among included studies. a random-effects meta-analysis model with the Der Simonian-Laird method was used to estimate the pooled effect size of satisfaction with HIV/AIDS care and treatment services with its 95% confidence interval (CI). Small study effects were assessed using Egger's regression test at a 5% level of significance. A meta-regression analysis and leave-one-out sensitivity analysis were also conducted.

Results: Twenty-four studies were included. The pooled level of satisfaction with HIV/AIDS treatment and care services in Ethiopia was 69.7% (95% CI: 63.8, 75.5%) with a significant level of heterogeneity ($I^2 = 98.0\%$; $p < 0.01$). Addis Ababa city administration has the highest (83.9%; 95% CI: 79.9, 87.9%) level of satisfaction, and Southern Ethiopia has the lowest (64.5%; 95% CI: 51.3, 77.8%). Even though variables were measured differently across primary studies and challenged to pool the effect estimates, most of the reviewed studies revealed satisfaction with HIV/AIDS care and treatment services was related to waiting times and the duration of receiving HIV/AIDS care. Moreover, this meta-analysis found gender (Odds Ratio (OR) = 1.11, 95% CI: 0.73, 1.69) and residence (OR = 1.10, 95% CI: 0.72, 1.69) had no significant association with satisfaction with HIV/AIDS care and treatment services.

Conclusions: More than two-thirds were satisfied with HIV/AIDS treatment and care services in Ethiopia. The findings showed the presence of regional differences in satisfaction with HIV/AIDS treatment and care services. The finding suggested that policymakers and healthcare administrators should focus on empowering patients to make treatment decisions,

pay attention to areas of service provision that affect HIV/AIDS care and treatment services, and make strategic plans for effective and better-quality services.

Protocol registration number CRD42023438589

Data availability statement: All data relevant to the study are included in the article or uploaded as supplementary information. Extracted data are available upon request from the corresponding author.

Keywords: Antiretroviral therapy, Ethiopia, Health facilities, HIV/AIDS care and treatment services, People living with HIV/AIDS, Satisfaction

Strength and limitation of this study

- This systematic review and meta-analysis were registered in the prospective register of systematic reviews (PROSPERO).
- This systematic review and meta-analysis followed Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines to describe the rationale and aims of this study, the methods that were used in identifying studies, and compose the report.
- The study provided up-to-date and comprehensive evidence on adult level of satisfaction with HIV/AIDS care and treatment services in Ethiopia, offering valuable insights for improving healthcare facilities' quality of care.
- The systematic review concentrated on observational studies, primarily cross-sectional, which do not establish a real cause-and-effect relationship between the factors and outcome variables.
- Due to the absence of data in some regions of Ethiopia, including Afar, Benishangul-Gumuz, Gambella, and Somali region, the study's pooled prevalence estimates could not be an accurate representation of the conditions in those regions.

Introduction

The Human Immunodeficiency Virus (HIV), which has killed 40.4 million people worldwide, continues to be a serious global public health problem. The World Health Organisation (WHO) estimates that at the end of 2022, about 39.0 million people living with HIV/ Acquired Immune deficiency syndromes(AIDS)(PLWHA) worldwide, with 25.6 million of them living in the WHO African Region [1]. The number of patients receiving antiretroviral therapy increased from 7.7 million in 2010 to 29.8 million by the end of December 2022. Globally, the use of antiretroviral therapy (ART) has demonstrated impressive results, with a reduction in HIV/AIDS-related deaths and new infections of 45% and 23%, respectively, over the previous ten years [2].

In December 2020, the Joint United Nations Programme on HIV/AIDS (UNAIDS) released a new set of ambitious targets that require 95% of all individuals living with HIV to be aware of their status, 95% of all individuals receiving antiretroviral therapy to be receiving treatment, and 95% of all individuals receiving treatment to have viral suppression by 2025 [3]. Furthermore, UNAIDS set a global goal to end the AIDS epidemic as a threat to public health by 2030, with the three zeros vision: zero deaths, zero new infections, and zero discrimination [3-5]. Despite these international initiatives, low- and middle-income countries (LMICs) still have difficulties ensuring treatment success, adherence to HIV treatment, retention in care, and optimal patient satisfaction [6-8].

In response to the HIV/AIDS epidemic, the Ethiopian government took action as early as 1985. As a result, the Federal Ministry of Health of Ethiopia (FMOH) has been executing a sector-wide reform to raise the standard and accessibility of ART care services in medical facilities across the nation [9]. According to the FMOH, ART program's rapid expansion in Ethiopia has dramatically decreased the number of AIDS-related deaths, with a 52% decrease in AIDS deaths in 2019 compared to the level in 2010. Similarly, of the total 79% of estimated PLHIVs that knew their status during 2019, 90% of them were taking ART of which 91% of them had viral suppression [9] [10]. Thus, the ART program's rapid expansion offered a once-in-a-lifetime chance to quickly scale up HIV/AIDS prevention, care, and treatment services. The expansion of ART access has received much attention, and adherence to treatment plans [11] and virological suppression [12] [13] are important factors that determine ART effectiveness..

Patient satisfaction, which has been widely described as the "cognitive and emotional response to the elements of care delivery and service [14]," is a sign of the quality of medical services and

a significant predictor of overall health outcomes [15-17]. In the medical sector, a key performance and outcome assessment is patient satisfaction with healthcare services. To make healthcare programs more patient-centered and efficient in light of limited resources, it may be helpful to assess how patients rate their care. This will allow for the identification of problems and the development of solutions [18] [19]. To make effective use of the healthcare system's limited resources, it is crucial to ensure patient satisfaction and high-quality care [19]; this is because patient satisfaction reflects the discrepancy between what is expected and received from the services provided [18].

Patient satisfaction is vital for HIV management as it boosts hospital visits, drug adherence, follow-up visits, and reduces disease rates. Satisfied patients adhere better to treatment plans and appointment to follow-up, and seek further advice; evidence shows patient satisfaction has a strong relationship with HIV care retention [8] [20] [21] the quality of health services [22], ART adherence [20] [22], better health outcome, and recommendations of the service to others [23] However, dissatisfied patients may experience non-compliance, opportunistic infections, medication resistance, and negative information, potentially discouraging others from seeking healthcare [24]. Moreover, studies revealed that satisfaction with HIV/AIDS treatment and care services was affected by waiting time to see health care providers [25] [26], the quality of reception services [27], time to reach health facility [28], the interpersonal and technical abilities of providers [26] [27], problems with accessibility, lack of laboratory services, unclean health restrooms [29], total time spent at health facility, and confidentiality [26].

Even so, there are a few studies that assessed the level of satisfaction and associated variables with HIV/AIDS treatment and care services among PLWHA in Ethiopia; these studies were restricted to a single institution, reported inconsistent and inconclusive findings, and demonstrated significant variation across various periods and geographical locations. The level of satisfaction varies across individual studies in Ethiopia, ranging from 46% in a study conducted in the health facilities of East Showa, Oromia, to 90.8% in studies conducted in Hawassa and Yirgalem[9] [29-33]. Moreover, there is limited evidence that provides a comprehensive understanding of the overall level of satisfaction with HIV/AIDS treatment and care services and its associated factors among PLWHA in Ethiopia. Therefore, this study aimed to generate a nationwide pooled estimate of the level of satisfaction with HIV/AIDS and associated factors by combining data from primary studies to provide a general overview of the effect across the country, aiming to inform policy decisions. It is crucial to discuss how regional differences impact the validity and applicability of this estimate, as it could serve as a baseline for targeted

studies or interventions, and the findings might aid healthcare professionals in enhancing service provision and overall health services.

Materials and methods

Study settings and design

This study was carried out in Ethiopia, a country in north-eastern Africa also referred to as the Horn of Africa, bordered by Kenya, South Sudan, Sudan, Djibouti, Eritrea, and Somalia. Based on the most recent United Nations figures, Ethiopia's population is predicted to be 123,415,729 as of July 16, 2023, placing it second in Africa behind Nigeria [34]. As of August 2023, Ethiopia has two administrative cities (Addis Ababa and Dire Dawa) and twelve regional states. The twelve regional governments are Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Gambella, Harari, Sidama, South West Ethiopia Peoples, and South Ethiopia Region. The last three regions, Sidama, South West Ethiopia Peoples', and South Ethiopia Region, were formerly included in the Southern Nations, Nationalities, and Peoples Region (SNNPR) (Supplementary figure 1). A systematic review and meta-analysis of observational studies were conducted on satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Protocol registration and reporting

The protocol for this systematic review was registered in the prospective register of systematic reviews (PROSPERO) with a registration number of CRD42023438589 on July 16, 2023. The Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used to guide the protocol of this review to ensure our procedure is reproducible and transparent [35]. The PRISMA-P 2020 guidelines were also used to describe the rationale and aims of our SRMA, the methods that were used in identifying studies (e.g., inclusion criteria), and analytic details [36].

Searching strategy and source of information

Several primary studies on the prevalence of patient satisfaction with HIV/AIDS treatment and care services provided among Ethiopian healthcare facilities were searched and discovered using international online databases (PubMed, Scopus, Hinari, and African journals online), and Google Scholar was manually searched using reference lists of individual studies. No restrictions on the year of publication were applied when searching for published research.

The "AND" and "OR" Boolean operators were used to create the search query individually or in combination using the following keywords: prevalence, patient satisfaction, antiretroviral therapy, health facilities, and Ethiopia. Medical Subject Headings (MeSH) and pertinent keywords related to the research topic were used with other search strategies.

We used search terms "HIV," "AIDS," "HIV/AIDS care and treatment'', ''ART'',' "Patient Satisfaction," "Determinants," and "Ethiopia" and their synonyms. These were verbalized as per the databases (Supplementary table1). Two independent authors identified the appropriate studies, while the other researchers settled any disputes. To locate, arrange, and remove duplicate records from the studies found using the search approach, Endnote X7 software was used.

Study selection and process

The **CoCoPop** mnemonics were used to establish inclusion and exclusion criteria for prevalence studies [37]. CoCoPop is composed of: condition (the illness, symptom, prevalence, or associated factors); Context refers to environmental factors, such as the geographic location, region, or time period, that affect the condition's incidence or prevalence; population is a description of the characteristics that define the population. Two researchers independently examined each article in three steps to determine which ones were included: titles, abstracts, and full texts of the remaining articles. The articles that fulfilled the screening were compiled together by two researchers, and disagreements were settled by consensus with the help of the other reviewers. The articles included in this systematic review and meta-analysis, which looked at the proportion of patient satisfaction with HIV/AIDS treatment and care services and its associated factors in Ethiopian health facilities, were chosen based on the criteria listed below.

Inclusion criteria

Outcomes of interest (condition): Articles that reported on the level of patient satisfaction with the HIV/AIDS treatment and care services and its associated factors provided by the healthcare facility.

Population: Adults (people aged 18 years old or older) living with HIV/AIDS receiving antiretroviral therapy.

Study settings (context): Studies conducted only in Ethiopia.

Study design: All types of observational studies (cross-sectional, case-control, and cohort) were included.

Language: The review included only English-language studies.

Publication status: Only published (journal articles) articles without restriction of date of publication were included.

Exclusion criteria

Articles that fail to report the main outcome of interest are excluded. Systematic reviews, brief communications, letters to the editor, comments, full qualitative research, articles that were difficult to access in full (after contacting the authors in question via email to request the complete texts), studies that does not fulfill the eligibility criteria, and duplicate articles were also excluded.

Outcome measurement

For this systematic review and meta-analysis, two primary outcomes were considered. The first outcome was the pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services provided by health facilities in Ethiopia, which was calculated by dividing the number of PLWHA satisfied with HIV/AIDS treatment and care services by the total people living with HIV/AIDS and, then multiplied by 100. The pooled Odds Ratio (OR) with 95% confidence interval (CI) was used to quantify the extent of the relationship between satisfaction with HIV/AIDS treatment and care services and the factors associated with PLWHA's satisfaction with HIV/AIDS treatment and care services, which was the second outcome. Moreover, a narrative review was done for variables with difficulty in pooling their effect on satisfaction with HIV/AIDS care and treatment services.

Data extraction process

All the relevant data was separately gathered by two authors from the primary articles. The data were extracted using a defined data extraction format that was created as a summary table in a Microsoft™ Excel spreadsheet. The data extraction from each abstract and/or full text of the article that was considered eligible includes the name of the first author followed by initials, region, study area, publication year, study design, study setting, sample size, response rate, and the outcome of interest (prevalence of patient's satisfaction with HIV/AIDS treatment and care services and its associated factors). The log odds ratio for every variable was computed using the primary study findings, and data were gathered in the form of a two-by-two table for the second outcome.

Assessment of the quality of the individual studies

The Newcastle-Ottawa Scale (NOS) was used to assess the quality of the included studies in this systematic review and meta-analysis [38]. As recommended by the NOS , we evaluated the included research using the following domains: **Domain 1: Selection (5 stars)** included the following factors: representativeness of the sample (1 star), sampling technique (1 star), response rate (1 star), and ascertainment of exposure (2 stars); **domain II: Comparability (2 stars)** included confounding control (data/results adjusted for relevant predictors/risk factors/confounders (2 stars); **domain III: Outcome (3 stars**) included outcome assessment (2 stars) and statistical tests (1 star). Following the addition of all stars in each of the three NOS domains for each primary study, studies with fewer than five scores were considered as poor quality, those with five to seven scores as moderate quality, and those with more than seven scores as high quality. [39] [40]. Regarding the comparability domains of NOS, studies must adjust for potential confounding factors ((e.g., multivariable regression models, matching or stratification techniques) that affect the level of satisfaction with HIV/AIDS treatment and care services to receive at least a "moderate" score and be considered in the meta-analysis [41]. An adequate sample size, power analysis, and generalizability are among the sample size requirements in NOS. Sufficient statistical power and accurate estimations are made possible by an adequate sample size [42]. As a result, the sample size of almost all included studies was justified and sufficient.

For this systematic review and meta-analysis, studies having a quality score of moderate or higher were taken into consideration. On the other hand, studies classified as poor were excluded from the study because they were deemed to be of poor quality.

The quality of the primary studies was evaluated independently by the two authors. Any disagreements that might have arisen between the two authors while evaluating the quality of individual studies were resolved through conversation and with the assistance of the other authors.

Data processing and analysis

The data were exported into STATA/SE version 17 statistical software for analysis after being extracted using a Microsoft Excel spreadsheet. Heterogeneity was assessed using the P-value result of the I^2 statistic and the Cochrane Q-test [43]. A P-value of < 0.10 denotes statistically significant heterogeneity, and values of 25%, 50%, and 75% were used to categorize the heterogeneity result as low, medium, and high, respectively [44] [45]. Therefore, Der Simonian and Laird's pooled effect was calculated using a random effects meta-analysis model. With a 95%

confidence interval, the estimated pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services was determined. To investigate differences in the prevalence across studies in the primary pooled analysis, a subgroup analysis was carried out by publication year, study setting, sample size, and study regions.

To statistically evaluate publication bias, the Egger weighted regression and Begg's rank correlation test methods were used (a two-sided p-value of ≤ 0.05 was regarded as suggestive of statistically significant publication bias), and the forest plot was also used graphically (visually) represent the presence of heterogeneity [46], based on the presumption that, in the absence of publication bias, the effect sizes of all the studies are normally distributed about the middle of a funnel plot, the trim-and-fill analysis was also performed to evaluate for and correct any publication bias [47]. Univariate meta-regression was used for mapping the potential source of heterogeneity and sensitivity analysis were carried out to evaluate the impact of a single study on the total pooled estimate.

Regarding the second outcome, an analysis was conducted using OR with 95% CI to assess the relationship between factors linked to HIV/AIDS treatment and care services satisfaction and the first outcome. A p-value of less than or equal to 0.05 was used to declare the association as statistically significant at 95% CI. Graphs, tables, texts, and a forest plot were employed to display the anticipated pooled level of satisfaction with HIV/AIDS treatment and care services and its associated factors.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Results

Study selection and identification

We located a total of 9076 articles using electronic searches, which included 1176 articles from databases and 7900 studies from Google Scholar searches. Of the 1176 articles in the database, 283 were left for screening after 893 were eliminated because they were duplicates. Out of 283 articles from database searches, 209 studies were excluded by looking at their titles and abstracts, 49 studies were excluded for not being able to retrieve, and 10 were also excluded due to the outcome not being indicated and poor data quality. Moreover, out of 7900 articles, 7,835 were excluded due to not being retrieved and excluded by title and abstracts from additional sources (Google Scholar), and after the remaining 65 articles were reviewed, 56

articles were excluded due to the outcome not being reported clearly, insufficient data, no full text available, and wrong research population. Finally, 24 eligible studies have been considered in this meta-analysis and systematic review (Figure 1).

Characteristics of the included studies

The 24 articles that were included were all facility-based cross-sectional studies, and they were all published. The number of participants in the included studies ranged from a low of 261 in one study in Dire Dawa, eastern Ethiopia [48], to a maximum of 721 in study done in the Tigray region [29]. This systematic and meta-analysis included 8940 individuals who were 18 years of age or older. In various parts of the nation, the primary studies were published between 2012 and 2024. Two city administrations (Addis Ababa and Dire Dawa) and five regions of Ethiopia were included in this review.

This systematic review and meta-analysis included three studies from Addis Ababa city administration [33 49 50], five from the Amhara region [9 51-54], one from Dire Dawa city administration [48], one from Harari Region [55], five from the Oromia region [30 56-59], seven from southern Ethiopia (by combining studies from Sidama, southeast Ethiopia, and south Ethiopia regional state[11 31 32 60-63], and two from Tigray regional state [29 64]. There were no studies reviewed from Afar, Benishangul Gumuz, Gambella, and Somali regional states of Ethiopia. A study conducted in the Hawassa and Yirgalem hospitals revealed the highest prevalence of satisfaction with HIV/AIDS treatment and care services (90.8%) [32], and a study conducted in the east shoa zone revealed the lowest prevalence (46.2%) [30]. While the majority of the research focused on HIV/AIDS care and treatment in general, three studies focused explicitly on ART laboratory services [32 33 54], and three studies on ART pharmacy services [9 50 52]. When analyzing the study based on the facility in which it was conducted, we found that 14 were from hospitals [9 32 33 48-50 53-55 57 61-64], 7 were from both hospitals and health centers [11 31 52 56 58-60], and 3 were from health centers [29 30 51].

Nearly all studies had a high response rate (> 91.6%), which might be due to the use of an interviewer-administered questionnaire for data collection. It is also important to note that almost all included studies used interview-administered structured questionnaires[9 11 29-33 48 50-58 60-62 64]. While few studies used a mixed method to collect the data (i.e., both document review and interview)[49 59 63], most used exit interviews to assess the level of satisfaction (Table 1). Studies that rely highly on exit interviews might have an impact on the outcome variables due to the social desirability bias and need to be interpreted with caution. Therefore, assessing the

level of satisfaction of patients on their last experience might result in the outcome variables being over- or underestimated.

Regarding the quality assessment we have used NOS and based on the quality assessment NOS score, we found that all research included in this systematic review and meta-analysis had reliable methodological quality, with scores ranging from 6 to 10 out of a possible 10 NOS points ((Supplementary table 2).

Table 1: Characteristics of the studies included in the systematic review and meta-analysis to show the prevalence of patient satisfaction with HIV/AIDS treatment and care services in Ethiopia.

Author name	publication year	Study Area	Study Region	Study Setting	Sample Size	Response rate (%)	Prevalence (95%CI)	Quality Score
Abdissa B et al.[58]	2024	Woliso town	Oromia	Both	361	100	54.6	8
Abebe TB et al.[9]	2022	Gondar university	Amhara	Hospital	291	98.3	54.7	8
Addisu G et al. [51]	2020	Gondar town	Amhara	Health Center	663	100	75.4	10
Atsebeha KG et al.[64]	2018	Shire – Endaslassie	Tigray	Hospital	422	99.5	75.2	10
Badacho AS et al.[60]	2023	Wolaita zone	Southern Ethiopia	Both	615	98.4	70.7	10
Belay M et al.[32]	2013	Hawassa and Yirgalem	Southern Ethiopia	Hospital	422	100	90.8	7
Belete TM et al.[52]	2023	Dembia district	Amhara	Both	308	100	76.95	9
Doyore F et al.[11]	2016	Hossana Town	Southern Ethiopia	Both	301	100	70.1	7
Eshetu A et al.[48]	2013	Dire Dawa	Dire Dawa	Hospital	261	91.6	54.6	6
Gezahegn M et al.[56]	2021	Jimma Town	Oromia	Both	383	100	85.5	9
Girmay A et al.[50]	2020	Addis Ababa	Addis Ababa	Hospital	285	100	78.9	9

Habtamu A et al.[57]	2017	Western Wollega Zone	Oromia	Hospital	266	95.8	57.6	8
Halili A et al.[63]	2024	Hadiya Zone	Southern Ethiopia	Hospital	422	100	53.1	10
Mekonnen T et al.[55]	2021	Harar town	Harari	Hospital	413	98	76.9	10
Mindaye T et al.[33]	2012	Addis Ababa	Addis Ababa	Hospital	422	96.2	85.5	9
Nigussie T et al.[61]	2020	MizanTepi University	Southern Ethiopia	Hospital	356	97.7	55.2	9
Tawiye NY et al.[53]	2021	Dessie	Amhara	Hospital	375	96.5	64.1	10
Tebeje M et al.[54]	2020	Bahirdar	Amhara	Hospital	422	100	53.3	9
Tessema SB et al.[29]	2015	In five zones of Tigray region	Tigray	Health Center	721	99.03	89.6	9
Tiruneh CT et al.[49]	2021	Addis Ababa	Addis Ababa	Hospital	420	100	86.4	8
Uma TH et al.[59]	2024	Woliso Town	Oromia	Both	334	100	81.4	10
Worku G et al.[62]	2020	Dilla town	Southern Ethiopia	Hospital	270	100	65.2	8
Yakob B et al.[31]	2016	Wolaita Zone	Southern Ethiopia	Both	485	99.5	46.4	9
Yilma TA et al.[30]	2021	East Shoa Zone	Oromia	Health Center	398	100	46.2	10

Meta-analysis

level of satisfaction with HIV/AIDS treatment and care services

The level of satisfaction with HIV/AIDS treatment and care services varied significantly across studies, as evidenced by the high and significant heterogeneity among included studies (I^2 = 98.04%, Q = 1175.4, degree of freedom (df) = 23, p-value < 0.01).

To estimate the pooled level of satisfaction with HIV/AIDS treatment and care services among people living with HIV/AIDS receiving ART in Ethiopia, a random-effect analysis model was employed. The pooled level of satisfaction with HIV/AIDS treatment and care services in Ethiopia was 68.7% (95% CI: 62.8, 74.6%) (Figure 2).

Publication bias

Begg's and Egger's regression tests were used to declare the presence of publication bias objectively, while the presence of possible small study effects was checked by using a funnel plot by visual inspection. The Egger tests (p-value < 0.01) and Beggs tests (p-value < 0.01) revealed significant publication bias among the included studies. The asymmetrical distribution in a funnel also indicated there are a small-study effects (Figure 3). Thus, to account for this publication bias trim and fill analysis was employed.

Trim and fill analysis

The nonparametric trim-and-fill analysis was employed to estimate the potential number of missing studies by minimising and correcting the publication bias in the studies. Only one study was imputed for missing study during the analysis, and the estimated pooled level of satisfaction with HIV/AIDS treatment and care services among PLWHA in Ethiopia appeared to be 69.7% (95% CI: 63.8, 75.5%) after accounting for publication bias. This value slightly differs from the unadjusted pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services in the random effect model (Supplementary figure 2).

Sub-group analysis

Subgroup analyses were conducted by study region, and year of publication, and included sample size to identify the potential source of study heterogeneity (Table 2). The subgroup analysis by region revealed that the highest pooled proportions of patient satisfaction with HIV/AIDS treatment and care services were found in the Addis Ababa city administration (83.9%, 95% CI: 79.9, 87.9%; $I^2 = 71.4\%$, $p = 0.03$) and Tigray regional states (82.5%, 95% CI: 68.4, 96.6%; $I^2 = 97.3\%$, $p < 0.01$), while the least was found in Southern Ethiopia (64.5%, 95% CI: 51.3, 77.8%; $I^2 = 98.5\%$, $p < 0.01$) (Supplementary figure 3).

A subgroup analysis based on the year of publication was also conducted to ascertain whether patient satisfaction with ART services varied from year to year. We classified the years of publication before 2021 and after 2021 based on the HIV/AIDS national strategic plan for Ethiopia 2021–2025 [65]. Therefore, before and in 2021, the pooled proportion of patients who were satisfied with HIV/AIDS treatment and care services was found to be 68.9% (95% CI: 61.7, 76.3%; $I^2 = 98.2\%$, p-value < 0.01), the finding showed that the satisfaction level was roughly the same for each category of the year (Supplementary figure 4).

According to the health facility where the included studies were conducted, the pooled level of satisfaction with HIV/AIDS treatment and care services among studies conducted at the health

center was (70.5%, 95% CI: 48.7, 92.26%, $I^2 = 99.2\%$; p-value < 0.01), even though there was significant heterogeneity among health facilities, the pooled level of satisfaction result did not change due to the confidence intervals overlap (Supplementary figure 5).

In this meta-analysis, subgroup analysis was done by sample size. After confirming that the data was approximately normally distributed, without significant outliers, and not skewed, we utilized the mean to categorize the sample size into two groups. Consequently, among studies with sample sizes larger than 372, the prevalence of satisfaction with HIV/AIDS treatment and care services was 70.8% (95% CI: 62.7, 78.9%; $I^2 = 98.7\%$, p-value < 0.01) (Supplementary figure 6).

Table 2: The pooled estimate of satisfaction with HIV/AIDS treatment and care services among people living with HIV/AIDS, 95% CI, and heterogeneity estimate with a p-value for the subgroup analysis.

Variables	Categories	Included studies	Pooled estimates (95%CI)	Heterogeneity (I^2, p - value)
By region	Addis Ababa	3	83.9% (79.9, 87.9)	71.4%, 0.03
	Amhara	5	64.6% (55.1, 74.1)	95.4%, < 0.01
	Eastern Ethiopia	2	65.8% (43.9, 87.6)	97.8%, < 0.01
	Oromia	5	65.1% (49.1, 81.2)	98.4%, < 0.01
	Southern Ethiopia	7	64.5% (51.3, 77.8)	98.5%, < 0.01
	Tigray	2	82.5% (68.4, 96.6)	97.2%, < 0.01
By publication year	≤ 2021	17	68.9% (62.8, 76.3)	98.2%, < 0.01
	> 2021	7	68.0% (57.7, 78.4)	97.6, < 0.01
By study setting	Hospital	14	68.1% (64.2, 75.9)	97.8, < 0.01
	Health Center	3	70.5% (48.7, 92.3)	99.2. < 0.01
	Both	7	69.14% (58.7, 79.6)	97.6, < 0.01
By sample size	≤ 372	15	65.7% (59.1, 72.4)	94.1%, < 0.01
	> 372	5	70.8% (62.71, 78.9)	98.6%, < 0.01

Meta-regression

In order to identify the specific reasons for the observed differences among studies, a meta-regression analysis was conducted. Sample size, quality of study, response rate, and publication year were all included as a covariate in the meta-regression analysis. However, the meta-regression analysis result showed that there was no statistically significant heterogeneity among included studies (Supplementary table 3).

Sensitivity analysis

The random effects model revealed no single study significantly impacted patient satisfaction with ART services, with no point estimates exceeding the 95% confidence interval (Supplementary figure 7).

Factors associated with satisfaction with HIV/AIDS treatment and care services

This section qualitatively examined the majority of the variables related to satisfaction with HIV/AIDS care and treatment services in Ethiopia. Overall, we found that most of the studies varied in their degree of adjustment for potential confounding variables that influence the likelihood of satisfaction with HIV/AIDS care and treatment services. Moreover, there was variability in the assessment of the relationship between factors and satisfaction with HIV/AIDS care and treatment services (i.e., factors were measured differently across studies as potential factors for satisfaction with HIV/AIDS care and treatment services). Because of this, it was challenging to pool and present the pooled effects of the majority of the variables linked to satisfaction with HIV/AIDS care and treatment services in Ethiopia.

Socio demographic factors

Nearly every included study evaluates and analyses sociodemographic aspects; depending on each factor, we attempt to qualitatively review and quantitatively analyze those studies. Eleven Ethiopian studies that were part of this systematic review and meta-analysis examined the relationship between marital status and satisfaction with HIV/AIDS care and treatment services. The association between marital status and satisfaction with HIV/AIDS care and treatment services was statistically nonsignificant in seven out of eleven studies [30 50-53 56 60]. Despite using different reference groups, four studies indicated a statistically significant relationship between marital status and satisfaction with HIV/AIDS care and treatment services [29 54 62 64]. The study's findings indicated that married participants were more likely to be satisfied with the HIV/AIDS care and treatment services than unmarried participants [54 62 64]. Nonetheless, one study found that single participants were more likely to be satisfied with HIV/AIDS care

and treatment services than widowed participants [29]. The association between gender and satisfaction with HIV/AIDS care and treatment services was evaluated in eight included studies; six of these studies found no significant relationship between gender and satisfaction [29 30 50 51 53 60]; only two studies [62 63] found a statistically significant relationship between gender and satisfaction with HIV/AIDS care and treatment services. Significant heterogeneity between studies was found using the random effects model estimate. According to the random effect model estimate, there is no significant association between gender and satisfaction with HIV/AIDS care and treatment services (Odds Ratio (OR) = 1.11, 95% CI: 0.73, 1.69; I^2 = 78.4%, p-value <0.01) (Supplementary figure 8).

Twelve studies examined the relationship between age and satisfaction with HIV/AIDS care and treatment services; eight of these studies found no significant relationship between age and satisfaction with these services [29 30 50 52 56 60-62], while four studies found a significant relationship between age and satisfaction [49 51 53 64]. Results from the research [64] indicated that the 36–45 age group is more likely to be satisfied than the 18–25 age group. This is consistent with findings from studies [49 51 53], which also showed that patients over 35 years old were linked to higher levels of satisfaction with HIV/AIDS care and treatment services. Six studies evaluated the association between place of residence and satisfaction with HIV/AIDS care and treatment services; two of these studies [29 53] found a statistically significant relationship, while four of the studies found no significant relationship. The pooled effect of these six studies showed residence of the participants had no significant association with satisfaction with HIV/AIDS care and treatment services (OR = 1.10, 95%CI: 0.72, 1.69; I^2 = 66.2%, p-value < 0.01) (Supplementary figure 9).

In Ethiopia, 15 included studies evaluated the relationship between educational status and satisfaction with HIV/AIDS care and treatment services. Of these, seven studies' results explained the non-significant relationship between educational status and satisfaction with HIV/AIDS care and treatment services [30 49-52 56 60], and eight studies explained the significant relationship between educational status and satisfaction with HIV/AIDS care and treatment services [11 29 53-55 58 61 62]. Even though the predictor variables came in different categories, five studies[11 53 58 61 62] found that individuals who had completed primary school, and more were more satisfied with HIV/AIDS care and treatment services than those who had no education, were illiterate, or were unable to read and write. The remaining three studies [29 54 55], however, found that those who were illiterate, no formal education, or did not read and write were more

satisfied with HIV/AIDS care and treatment services than those who were literate, college-educated, or above.

Length of stay with ART treatment and satisfaction with HIV/AIDS treatment and care services

Six of the 24 included studies examined the relationship between the duration of ART treatment and satisfaction with HIV/AIDS care and treatment. Despite varying levels of variable categories, four studies found a statistically significant relationship between satisfaction with HVI/AIDS care and treatment and the length of ART treatment. In one study, participants who had been on ART for more than four years reported higher levels of satisfaction with HIV/AIDS care and treatment [55]. According to one study, participants who had been on ART for more than four years were less likely to be satisfied with the care and treatment they received for HIV/AIDS [56]. According to two studies, individuals with HIV/AIDS who had been receiving ART for longer than two years were more likely to be satisfied with the care and treatment they received [49] [61]. However, the other two studies reported a statistically non-significant relationship between satisfaction with HVI/AIDS care and treatment and the length of ART treatment [30] [51].

Waiting time and satisfaction with HIV/AIDS treatment and care services

To determine whether waiting time and satisfaction with HIV/AIDS treatment and care services are associated, six included studies were reviewed. There is no statistically significant relationship between waiting time and satisfaction with HIV/AIDS treatment and care services, according to one study [57], while five [50] [53] [55] [56] [58] of the six studies found a statistically significant association between waiting time and satisfaction that have different levels of waiting time categories. Based on the results of those studies, one study indicated that those who had to wait 30 to 60 minutes to receive treatments were less likely to be satisfied with HIV/AIDS treatment and care services than people who had to wait less than 15 minutes [56]. Similarly, three studies[53] [55] [58] found that waiting times under 30 minutes were more likely to result in satisfaction with HIV/AIDS treatment and care services than waiting times over 30 minutes. Additionally, another study found that shorter waiting times were associated with the highest likelihood of satisfaction with HIV/AIDS treatment and care services [50].

Discussion

Patient satisfaction plays a crucial role in assessing the level of service quality provided by healthcare professionals [66] [67]. Assessment of patient satisfaction can also help identify unmet patient needs and targeted interventions, improve the performance of health services, a nd predict adherence [20] [22] and treatment outcomes [17].

In this systematic review and meta-analysis, the pooled level of satisfaction with HIV/AIDS treatment and care services among adult people living with HIV/AIDS in Ethiopia among studies published between 2012 and 2024 was 68.7% (95% CI: 62.8, 74.6%) with a significant level of heterogeneity (I^2 = 98.0%; p < 0.01). However, the estimated level of satisfaction was changed to 69.7% (95% CI: 63.8, 75.5%) following modification with the trim and fill analysis due to publication bias. The results were consistent with previous studies carried out in Nigeria, where about 67.5-77.0% of participants were satisfied with HIV/AIDS treatment and care services [8] [68-70]; Uganda, where 64.2% [71]; Spain, where 71.9% [72]; and China, where 67.1% of participants were satisfied with the HIV care service [73].

The findings of this systematic review and meta-analysis were higher compared with the results of studies conducted in Vietnam, where 42.4% of patients were satisfied with all elements of their HIV/AIDS care [74]; studies carried out at various Nigerian health facilities revealed that patient satisfaction with ART services ranged from 46.9% to 52% [75] [76]; a study conducted in Ukraine reported about 55.6% of the patients were satisfied with their HIV/AIDS care [77]; and studies in Pakistan showed 57.7% of people living with HIV/AIDS attending the HIV/AIDS clinic were satisfied with the health care services [78] [23].

Moreover, the findings of this systematic review and meta-analysis were lower than a study done in India (92.6%) [25], a study done in Brazil where patient satisfaction with HIV/AIDS health services was 81% and 86% in hospitals and health units, respectively [22], with another Brazilian study in which 96.7% of individuals satisfied with healthcare services after three months of initiation of antiretroviral therapy [79], and with study conducted in Russia, where 86% of the sample reported a high degree of satisfaction with HIV care delivery [80]. This finding was also lower than a prospective observational study conducted at PEPFAR-supported clinics in four African countries, in which 89.6% of PLWHIV reported being satisfied with their care [81], with a study done in Tanzania (92.3%) [82], with a study done in South Africa (98%) [83], and Cameroon (91.2%) [84].

The possible justification for the difference in the level of satisfaction with HIV/AIDS care in this review as compared to previous studies might be due to differences in the study design, sample size, variations in the patient's clinical, socio-demographic, or psychological characteristics, and the lack of a globally accepted definition of patient satisfaction or measuring methodology, health services provision, service quality, communication, information dissemination, work environment arrangements, and integration of mental health services into HIV care services. Furthermore, the utilization of different data collection methods may be the reason for the potential discrepancy between previous studies in which the current study findings might be affected by primary studies' use of interview-administered data collection methods, mainly exit interviews, which may result in biased results due to patients' recent experiences and the pressure to give positive feedback from healthcare professionals, potentially increasing satisfaction scores [85]. Assessing patient satisfaction with medical treatments is crucial for identifying unmet client needs. Therefore, strengthening support networks and enhancing the quality of care can increase patient satisfaction with HIV/AIDS treatment and care services [86].

The primary studies included in this systematic review and meta-analysis showed statistically significant heterogeneity. As a result, a subgroup analysis was carried out. The subgroup analysis by region revealed differences in patient satisfaction with HIV/AIDS care and treatment services. The results showed that the Addis Ababa city administration, with 83.9% (95% CI: 79.9, 87.9%), and the Tigray region with 82.5% (95% CI: 68.4, 96.6%), respectively, had the highest level of patient satisfaction with HIV/AIDS treatment and care services. While the lowest were in Oromia and Southern Ethiopia, both at 65.8% (95% CI: 49.1, 81.2%) and 64.5% (95% CI: 51.3, 77.8%), respectively. Differences in diagnostic facilities, service provision, the availability and accessibility of free medications, availability of support services, the establishment of feedback mechanism, implementation of health policy and governance, community engagement, the number of qualified and sufficient health professionals, and the integration of services may all contribute to regional variations in the level of satisfaction with HIV/AIDS treatment and care services [87]. Furthermore, variations in the study quality, confounding, and differences in the methods used to measure the level of satisfaction with HIV/AIDS treatment and care services in the primary studies; since there is no widely accepted definition of patient satisfaction or measurement methodology [23], difference in the data collection methods, and analysis techniques; might all lead to varied pooled estimates and a source of high heterogeneity. Therefore, the substantial heterogeneity in study results due to

differences in outcome measures highlights the need for more precise definitions of the level of satisfaction with HIV/AIDS care and treatment services in future research, and recognizing high heterogeneity can also highlight gaps in the literature and suggest areas for further investigation. Variations in patient satisfaction with HIV/AIDS care and treatment services across regions suggest the need for context-appropriate health service delivery. Systematic interventions at the regional level to increase patient satisfaction & outcomes in HIV/AIDS care, including community engagement and policy reform, are essential in improving quality care and equal access to patients.

Besides sociodemographic characteristics, satisfaction with HIV/AIDS care and treatment services was related to waiting times and the duration of receiving HIV/AIDS care. Even though those variables were measured differently across primary studies, it was challenging to pool the effect estimates, and according to a narrative review, PLWHA were more likely to be satisfied with HIV/AIDS care and treatment services if they had received care and treatment for a longer duration and shorter waiting times. A literature review on patient satisfaction with antiretroviral treatment services supported these findings [88]. A possible explanation for the reason why patients who have been on ART for a longer time may be more satisfied with HIV/AIDS treatment and care services might be due to having had more opportunities to interact with peer support groups and counseling, which can help them develop better-coping mechanisms and mental health. Additionally, longer ART engagement denotes constant care, which promotes stability and dependability within the healthcare system [89] [90]. Short waiting times for HIV/AIDS treatment and care services lead to increased patient satisfaction, reduced anxiety, improved efficiency, better continuity of care, enhanced engagement, and better time management [91]. Consistent with studies that revealed that time spent in a medical facility is a significant factor in patient satisfaction [92] [93]. The findings highlight the importance of wait time reduction as a top priority in the healthcare facility because long wait times might hinder patients from keeping appointments, which can result in default and nonadherence to treatments [93].

Strength and limitation of the study

The strength of this systematic review and meta-analysis was it was registered in the PROSPERO, followed Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines to compose the report, and provided up-to-date and comprehensive evidence on adult level of satisfaction with HIV/AIDS care and treatment services in Ethiopia, offering valuable insights for improving healthcare facilities' quality of care.

There may be some limitations to this study which are due to the absence of data in some regions of Ethiopia, including Afar, Benishangul-Gumuz, Gambella, and Somali region, the study's pooled prevalence estimates could not be an accurate representation of the conditions in those regions. Due to the high sensitivity of Cochran's Q test to the small number of studies included in the meta-analysis, our overall estimations revealed significant heterogeneity among studies, which may indicate that careful interpretation of the results is essential. One limitatio n of this meta-analysis is that there is no widely accepted definition of patient satisfaction or measurement methodology, as most of the included studies used a Likert scale to assess satisfaction, but they varied by categorization to produce binary outcomes; some used mean/median, while others used percentage scores; these differences may explain the high heterogeneity of the study estimate. Not every possible aspect that could have affected satisfaction was covered in the included articles. The systematic review concentrated on observational studies, primarily cross-sectional, which do not establish a real cause-and-effect relationship between the factors and outcome variables. Despite being an issue in any meta-analysis, publication bias was found in the pooled estimates. Moreover, NOS does not assess publication bias or statistical power; even after controlling for all pertinent confounding variables, bias may still exist due to differential missing data, incorrect exposure classifications, and inaccurate confounding factor measurement [94], and this systematic review and meta-analysis's decision to include high-quality studies and exclude lower-quality ones may affect the final results and conclusions derived from the synthesis of findings; that all included studies were high-quality suggests that the assessment tool was not sensitive enough, as the tool cannot filter results if all studies are of the same quality.

Practical implications of the study

The following are some of the practical implications of the study on the level patient satisfaction and its associated factors with HIV/AIDS treatment and care services in Ethiopia: Identifying factors that impact patient satisfaction might help policymakers and health care providers to identify gaps in the provision of ART services, which includes improving the quality of services, reducing the waiting time, and ensuring the facilities have adequate stocks of the drugs. Achieving patient adherence to ART is critical to viral load suppression and health outcomes, and healthcare systems can improve adherence by resolving the issues of patient dissatisfaction. The findings can help develop better patient-centered care approaches. The evidence can help policymakers in identifying areas that require patient satisfaction interventions, resource allocation, and arguing for additional funding for the HIV/AIDS

programs. The research could underscore the importance of engaging patients and community members in making decisions related to their care. The findings will be helpful when conducting further research on some areas of HIV/AIDS management that satisfy the patient's needs. Furthermore, the evidence obtained from this study can not only be useful in the Ethiopian region but also for cross-cultural and cross-national comparisons of the level of patient satisfaction and its related factors in low- and middle-income countries. Finally, there is potential for improving the quality of care and the measured health outcomes necessary to enhance the global response to HIV/AIDS.

Conclusion and recommendations

More than two-thirds (69.7 %) of the PLWHA in this systematic review and meta-analysis were satisfied with HIV/AIDS treatment and care services provided in Ethiopia. There were regional differences in patient satisfaction with ART services, with the Addis Ababa city administration having the highest rates and the Oromia region having the lowest. The review's sociodemographic characteristics were the most varied. There was inconsistency in the measurement of variables that related to the level of satisfaction with HIV/AIDS treatment and care services. Even though variables were measured differently across primary studies and challenged to pool the effect estimates, most of the reviewed studies revealed satisfaction with HIV/AIDS care and treatment services was related to waiting times and the duration of receiving HIV/AIDS care. Moreover, gender and residence of the participants were not significantly associated with the level of satisfaction with HIV/AIDS care and treatment services.

Therefore, the findings allow healthcare providers to identify service factors that are necessary to improve patient satisfaction in HIV/AIDS treatment and care. These factors include improving the physical environment, giving patients more control over their treatment, increasing access to medical personnel, equipment, and laboratory services, and overall contributing to improved quality of life among PLWHA, adherence to ART, and retention in HIV care services. Addressing regional disparities through focused interventions and community involvement can enhance HIV/AIDS care outcome and overall patient satisfaction.

To reduce HIV-related mortality, it is advised that in addition to increasing the number of patients receiving treatment, policymakers and healthcare organizations should pay attention to aspects of service provision that may have an impact on patient satisfaction, and to make strategic plan for effective and better-quality services. It was suggested that waiting periods be reduced in order to create an environment that improves patient-physician interactions and

promotes good treatment outcomes. Furthermore, due to the factors influencing patient satisfaction with HIV/AIDS care and treatment being multifaceted, more research is needed to identify additional factors, especially from the perspective of the patient, and investigate facility-specific strategies to improve the quality of HIV/AIDS care. Future studies ought to consider using mixed methods or triangulating data collection approaches to provide a more thorough understanding of patient satisfaction with ART services in Ethiopia so that policies and practices can be improved.

Abbreviations

ART: Antiretroviral Therapy, **OR**: Odds Ratio; **AIDS**: Acquired Immunodeficiency Syndrome, **CI**: Confidence Interval, **FMOH:** Federal Minister of Health, **HIV**: Human Immunodeficiency Virus, **UNAIDS**: Joint United Nations Programme on HIV/AIDS, **PLWHA**: People living with HIV/AIDS, **PROSPERO**: Prospective Register of Systematic Reviews, **PRISMA**: Preferred Reporting Items for Systematic Reviews and Meta-Analyses, **WHO**: World Health Organization.

Declarations

Ethical approval and consent to participate

Not applicable

Consent for publication

Not applicable

Data availability statement

All data relevant to the study are included in the article or uploaded as supplementary information. Extracted data are available on request to the corresponding author.

Funding

This study was financially supported by Dilla University. However, the funder had no role in the design, data extraction, analysis, and interpretation of the data, in writing the manuscript, or in the decision to submit it for publication.

Competing interests

The authors have declared that no competing interests exist.

Authors contribution's

HEH is responsible for the overall content as a guarantor. **HEH** and **BGD** conceptualized the original draft, prepared it, and developed the methodology, statistical analysis, and tool development. **ZA, DS, EA, MA,** and **TTM** participated in the investigation, software validation, statistical analysis, and manuscript preparation. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

Acknowledgments

We would like to thank Dilla and Addis Ababa University, Ethiopia, for providing free access to the online library so that you can browse the electronic databases.

Supplementary file

Supplementary Table 1. Database and google scholar searching items and results.

Supplementary Table 2. Quality assessment of included studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis.

Supplementary Table 3. Meta-regression analysis result.

Supplementary figure 1. Ethio map.

Supplementary figure 2. Trim and fill analysis result.

Supplementary figure 3. Sub-group analysis by region.

Supplementary figure 4. Sub-group analysis by publication year.

Supplementary figure 5. Sub-group analysis by study setting.

Supplementary figure 6. Sub-group analysis by sample size.

Supplementary figure 7. Sensitivity analysis.

Supplementary figure 8. The association between gender and satisfaction with HIV/AIDS treatment and care service.

Supplementary figure 9. The association between residence and satisfaction with HIV/AIDS treatment and care service.

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Figure legend

Figure 1: PRISMA flowchart of the study selection and identification process on Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Figure 2: A forest plot showing the pooled prevalence of Satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Figure 3: Funnel plot displaying the publication bias of studies reporting the pooled prevalence of satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

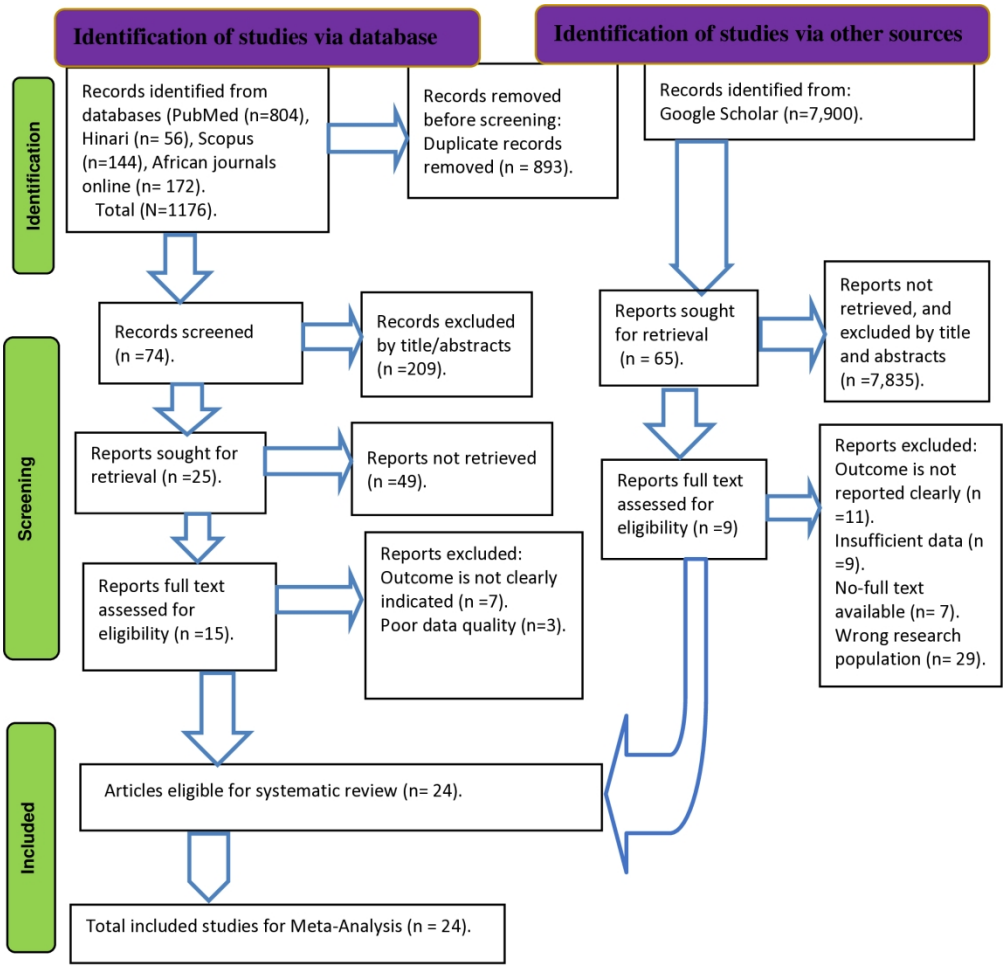


Figure 1: PRISMA flowchart of the study selection and identification process on satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

181x203mm (300 x 300 DPI)

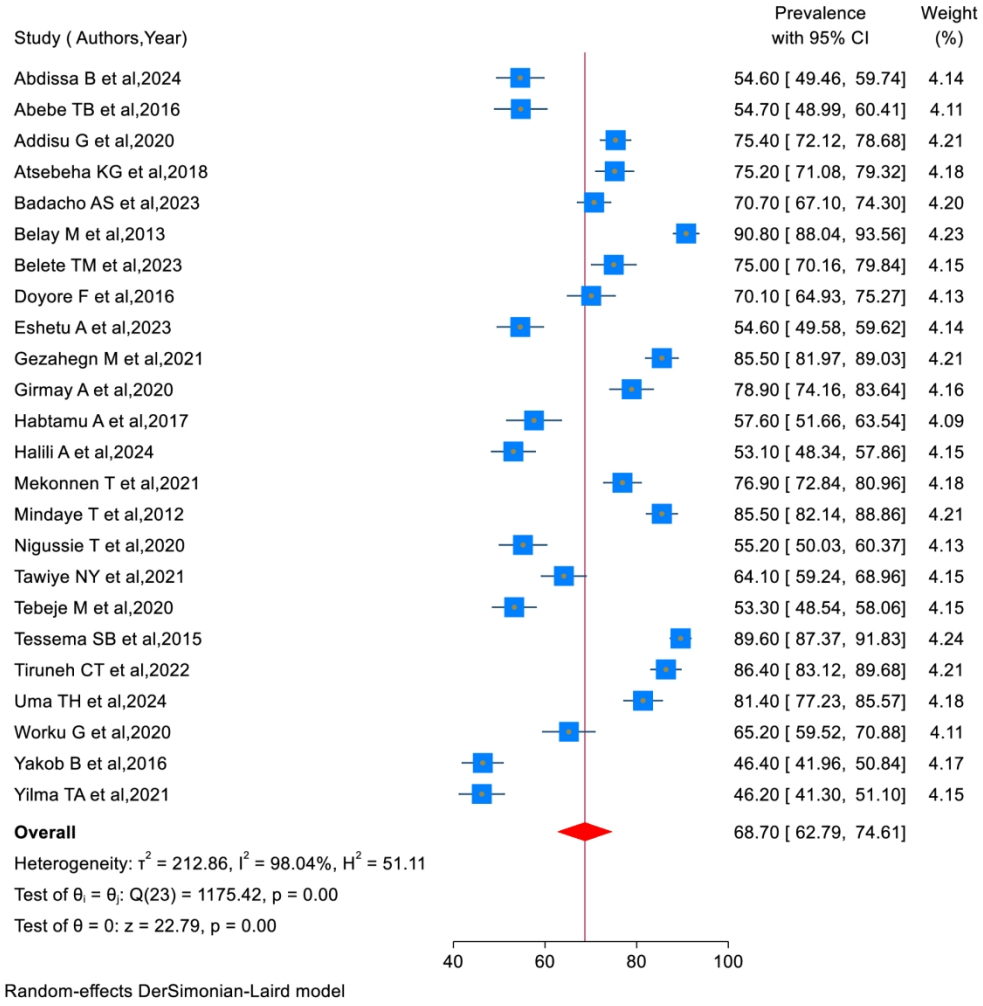


Figure 1: A forest plot showing the pooled prevalence of Satisfaction with HIV/AIDS care treatment and services in Ethiopia

164x180mm (300 x 300 DPI)

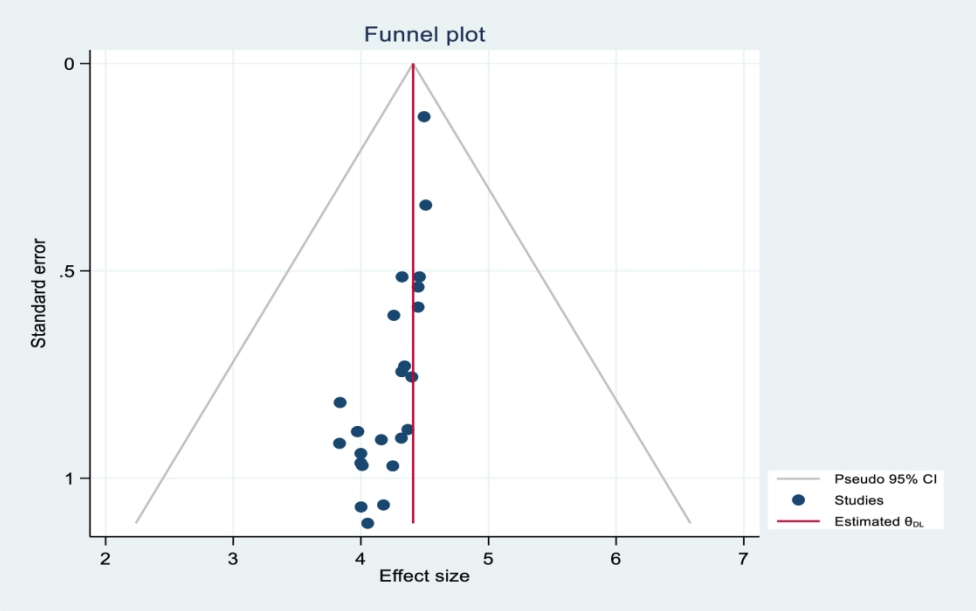


Figure 1: funnel plot displaying the publication bias of studies reporting the pooled prevalence of patient satisfaction with HIV/AIDS treatment and care services in Ethiopia.

166x117mm (300 x 300 DPI)

Supplementary table 1. Databases and google scholar search results for assessing level of satisfaction with HIV/AIDS treatment and care services and its associated factors among adult people receiving antiretroviral therapy in Ethiopia.

Databases	Searching terms	Number of studies
PubMed	("patient satisfaction"[MeSH Terms] OR ("personal"[All Fields] AND "satisfaction"[All Fields]) OR "client satisfaction"[MeSH Terms]) OR "client satisfaction"[All Fields]) AND HIV/AIDS[All Fields] AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields]) AND care[All Fields] AND "services"[All Fields] AND associated[All Fields] AND factors[All Fields] AND ("adult"[MeSH Terms] OR "adult"[All Fields]) AND ("persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]) AND living[All Fields] AND HIV/AIDS[All Fields] AND "Ethiopia"[MeSH Terms] or "Ethiopia"[All Fields] * OR "Addis Ababa*"[tw] OR "Dire Dawa*"[tw] OR "east Ethiopia*"[tw] OR "Harari Region*"[tw] OR "Somali Region*"[tw] OR "northeast Ethiopia*"[tw] OR "north Ethiopia*"[tw] OR "Tigray Region*"[tw] OR "Afar Region*"[tw] OR "northwest Ethiopia*"[tw] OR "west Ethiopia*"[tw] OR "southwest Ethiopia*"[tw] OR "South West Ethiopia Peoples' Region*"[tw] OR "Southern Nations, Nationalities, and Peoples' Region*"[tw] OR "Sidama Region*"[tw] OR "Oromia Region*"[tw] OR "Gambela Region*"[tw] OR "Benishangul-Gumuz Region*"[tw] OR "Amhara Region*"[tw] OR "southeast Ethiopia*"[tw] OR "south Ethiopia regional state*"[tw].	804
HINARI	Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	56
Scopus	Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	144
African journal online	Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	172
Google scholar	"Patient satisfaction" or "client satisfaction" and "determinants" or "associated factors" and "adult" or "HIV/AIDS" and "treatment and care service" or "antiretroviral therapy services" or "ART service" and "ART clinic" or "healthcare facility" and "Ethiopia"	7900
Total article retrieved		9076
Number of included studies		24

(Supplementary table 2). Quality assessment of studies using the modified Newcastle Ottawa scale for cross sectional studies for systematic review meta-analysis of satisfaction with HIV/AIDS treatment and care services and its associated factors among people living with HIV/AIDS in Ethiopia.

	Selection (5 stars)				**Comparability (2 stars)**	**Outcome (3 stars)**		
Author name	Representativeness of the sample (*)	Sample size (*)	Non-respondents (*)	Ascertainment of the exposure (**)	Confounding factors controlled (**)	Assessment of outcome (**)	Statistical test (*)	Total quality score (**10***)
Abdissa B et al	-	*	-	**	**	**	*	******** (8)
Abebe TB et al.	*	*	*	-	**	**	*	******** (8)
Addisu G et al.	*	*	*	**	**	**	*	********* (10)
Atsebeha KG et al.	*	*	*	**	**	**	*	*********(10)
Badacho AS et al.	*	*	*	**	**	**	*	*********(10)
Belay M et al.	-	*	*	*	**	*	*	*******(7)
Belete TM et al.	*	*	*	*	**	**	*	********* (9)
Doyore F et al.	-	*	*	*	*	**	*	*******(7)
Eshetu A et al.	*	*	-	*	*	*	*	*******(6)
Gezahegn M et al.	*	*	*	*	**	**	*	********* (9)
Girmay A et al.	*	*	*	*	**	**	*	********* (9)
Habtamu A et al.	*	*	-	*	**	**	*	******** (8)

Halili A et al.	*	*	*	**	**	**	*	*********(10)
Mekonnen T et al.	*	*	*	**	**	**	*	*********(10)
Mindaye T et al.	*	*	*	**	**	*	*	*********(9)
Nigussie T et al.	*	*	*	*	**	**	*	*********(9)
Tawiye NY et al.	*	*	*	**	**	*	*	*********(10)
Tebeje M et al.	*	*	*	*	**	**	*	*******(9)
Tessema SB et al.	*	*	*	*	**	**	*	*********(9)
Tiruneh CT et al.	*	*	-	*	**	**	*	********(8)
Uma TH et al.	*	*	*	**	**	**	*	*********(10)
Worku G et al.	-	*	-	**	*	**	*	********(8)
Yakob B et al.	*	*	*	*	**	**	*	*********(9)
Yilma TA et al.	*	*	*	**	**	**	*	*********(10)

Descriptions of quality measurement adapted for cross sectional study

Selection: (Maximum 5 stars or 5 points)

1) Representativeness of the sample:

a) Truly representative of the average in the target population. * (all subjects or random sampling): **1 point**

b) Somewhat representative of the average in the target population. * (non-random sampling): **1 point**

c) Selected group of users: **0**

d) d) No description of the sampling strategy: 0

2) Sample size:

a) Justified and satisfactory: **1 point**

b) Not justified: **0**

3) Non-respondents:

a) Comparability between respondents and non-respondents' characteristics is established, and the response rate is satisfactory: **1 point**

b) The response rate is unsatisfactory, or the comparability between respondents and non-respondents is unsatisfactory: **0**

c) No description of the response rate or the characteristics of the responders and the non-responders: **0**

4) Ascertainment of the exposure (risk factor):

a) Validated measurement tool: **(2points)**

b) Non-validated measurement tool, but the tool is available or described: (**1 point)**

c) No description of the measurement tool. **0**

Comparability: (Maximum 2 stars or 2 points)

1) The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled.

a) The study controls for the most important factor (select one): 1 point

b) The study control for any additional factor: 1 point

Outcome: (Maximum 3 stars or points)

1) Assessment of the outcome:

a) Independent blind assessment: **2 points**

b) Record linkage: **2 points**

c) Self-report: **1 point**

d) No description: **0**

2) Statistical test:

a) The statistical test used to analyse the data is clearly described and appropriate, and the measurement of the association is presented, including confidence intervals and the probability level (p value): **1 point**

b) The statistical test is not appropriate, not described or incomplete. **0**

Note: 1 asterisk or star (*) is equivalent to 1 point

Decisions of on the quality of the studies were based on the sum or total score:

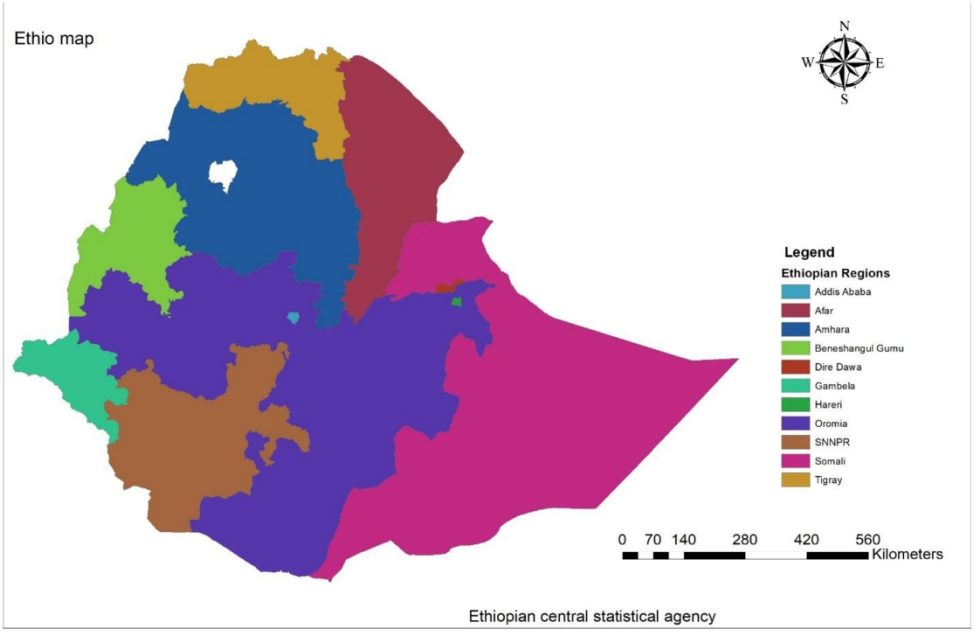
- **High quality studies: 7-10 points**
- **Low quality studies: 0-6 points**

Reference:

1. Modesti PA, Reboldi G, Cappuccio FP, et al. Panethnic differences in blood pressure in Europe: a systematic review and meta-analysis. PLoS One. 2016;11(1): e0147601.
2. Ssentongo P, Ssentongo AE, Heilbrunn ES, Ba DM, Chinchilli VM. Association of cardiovascular disease and 10 other pre-existing comorbidities with COVID-19 mortality: A systematic review and meta-analysis. PLOS ONE. 2020;15(8): e0238215.

Supplementary table 3: Univariate meta-regression analysis to identify possible source of heterogeneity among the included studies.

Source of heterogeneity	Coefficients	Standard error	95% CI	I^2(%)	P - value
Publication year	-1.045	0.828	-2.67, 0.58	97.71	0.207
Sample size	0.031	0.026	-0.02, 0.08	97.85	0.222
Response rate	0.456	2.348	-4.12, 5.04	98.13	0.845
Quality of included study	1.328	2.658	-3.89, 6.54	98.13	0.617



Supplementary figure 1. The Ethiopian map divided by regions (Source: Central statistical agency).

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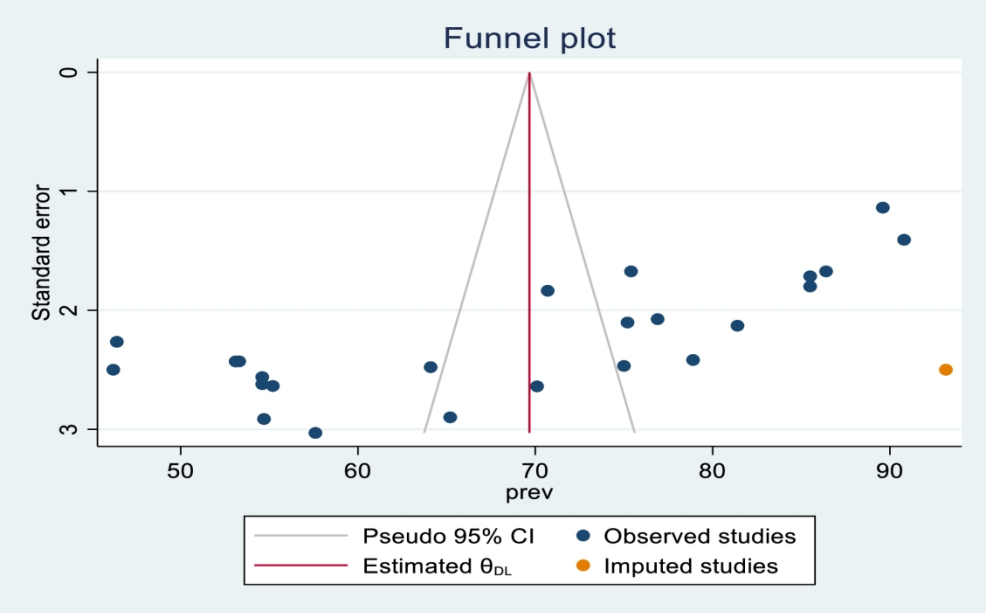
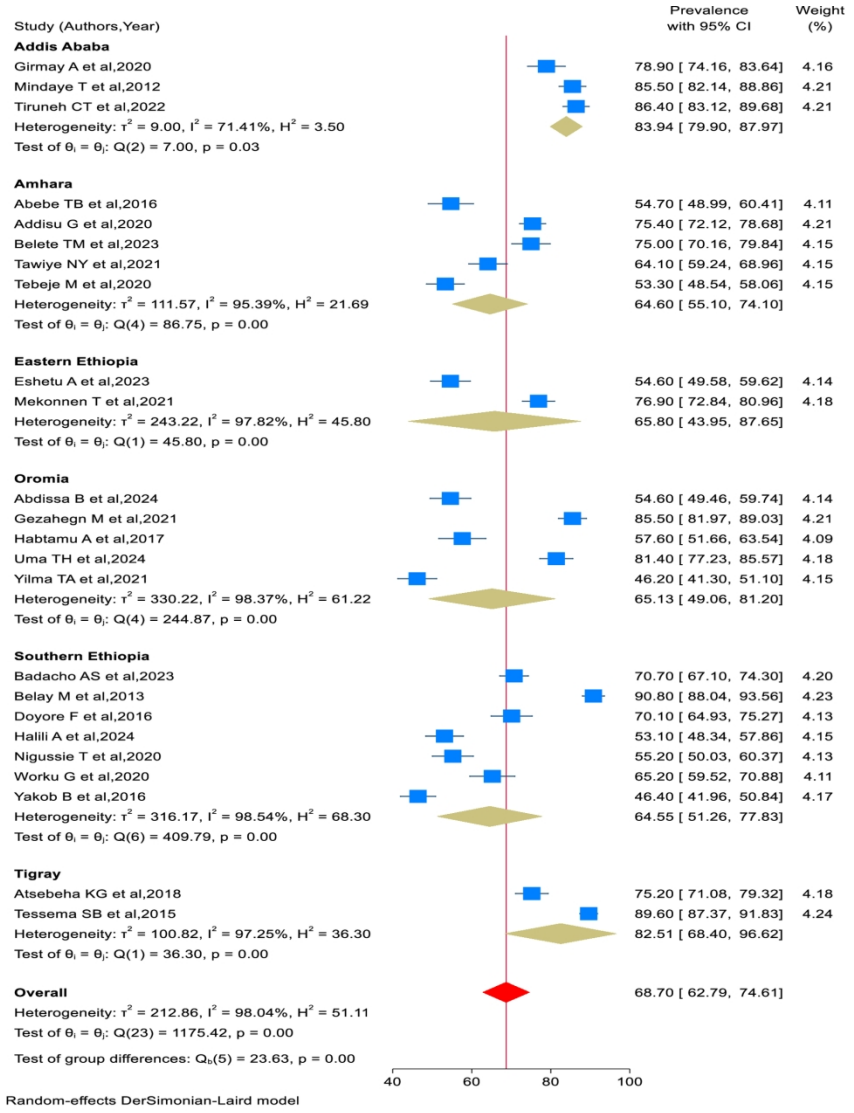


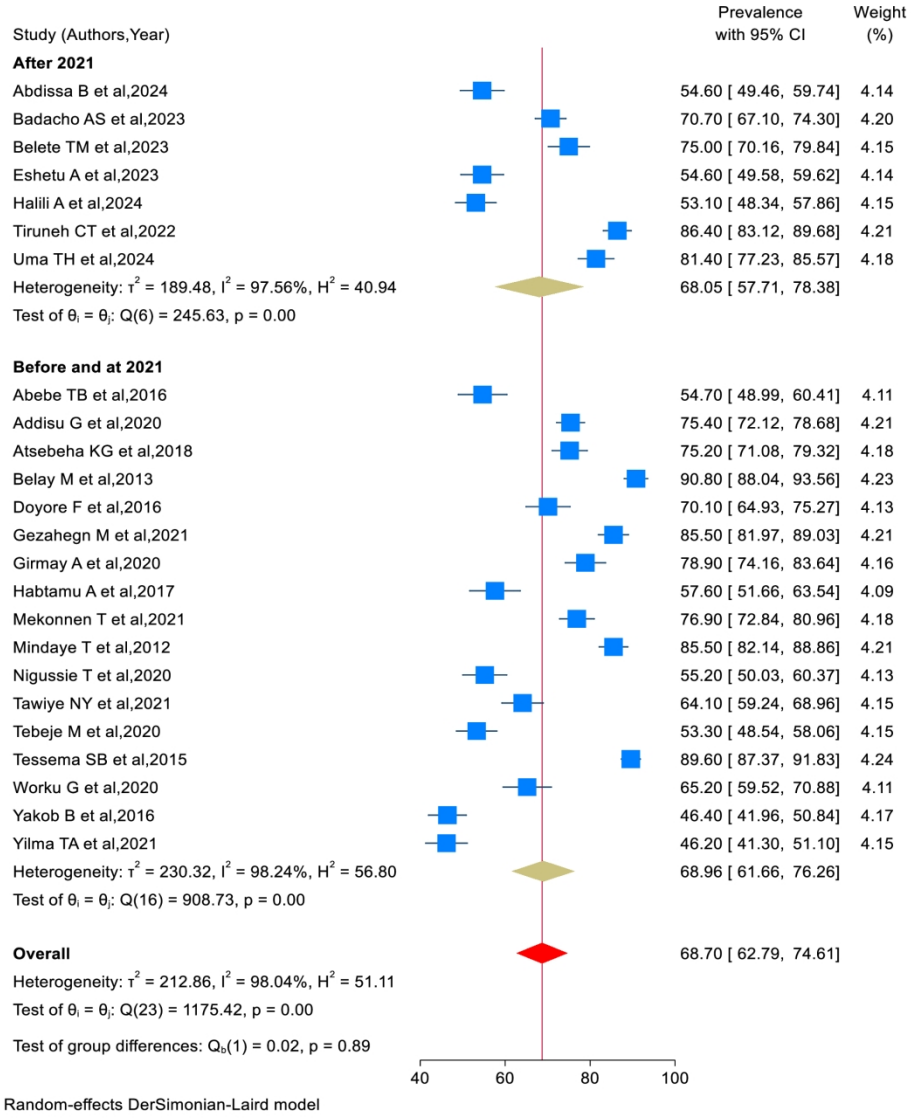
Supplementary figure 2. The plot of trim-and-fill analysis for correcting publication bias of 24 studies.

165x118mm (300 x 300 DPI)



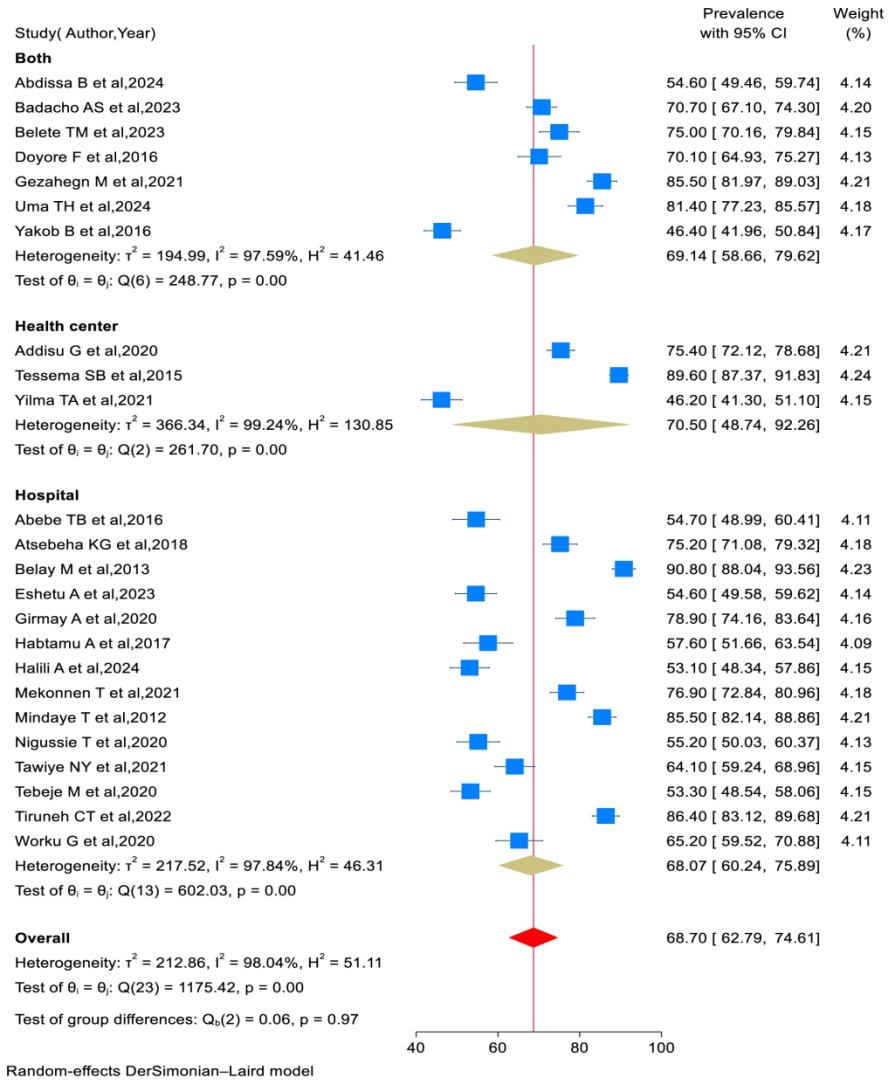
Supplementary figure 3. Forst plot showing subgroup analysis by region for the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

164x222mm (300 x 300 DPI)



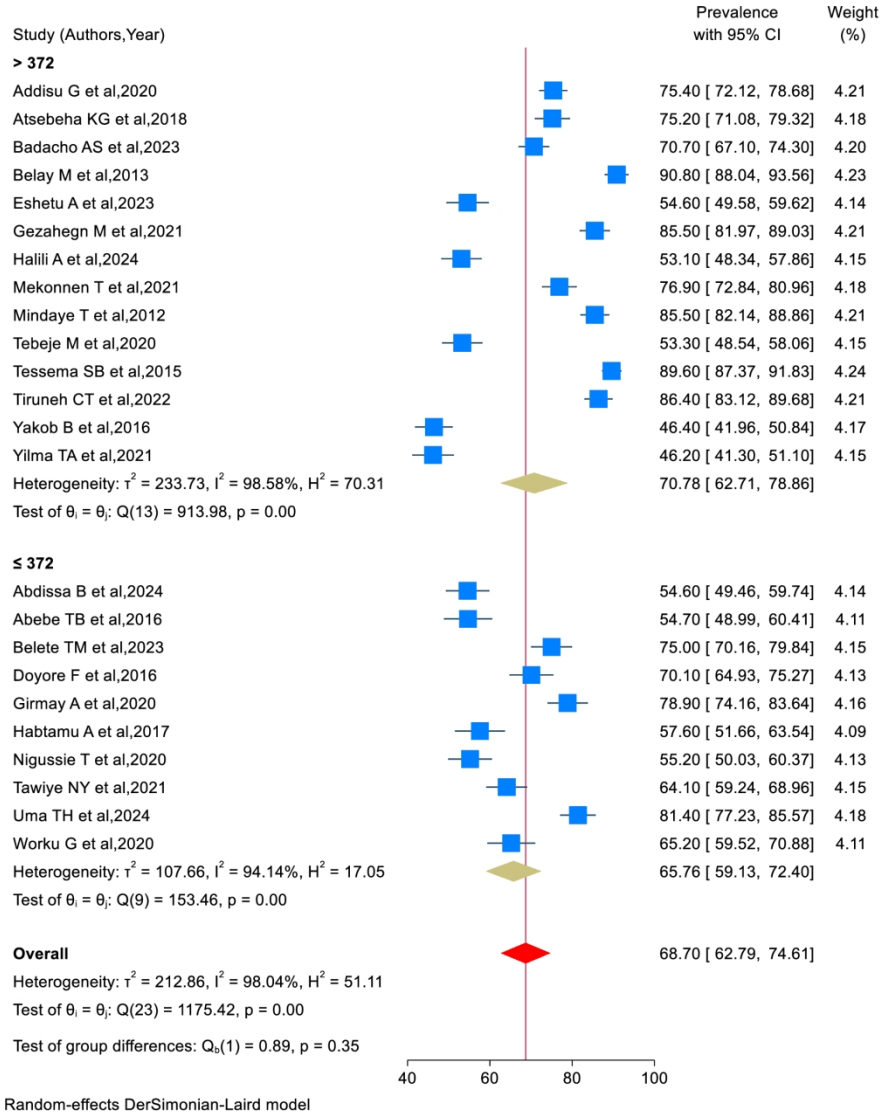
Supplementary figure 4. Forest plot showing subgroup analysis by year of publication to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x212mm (300 x 300 DPI)



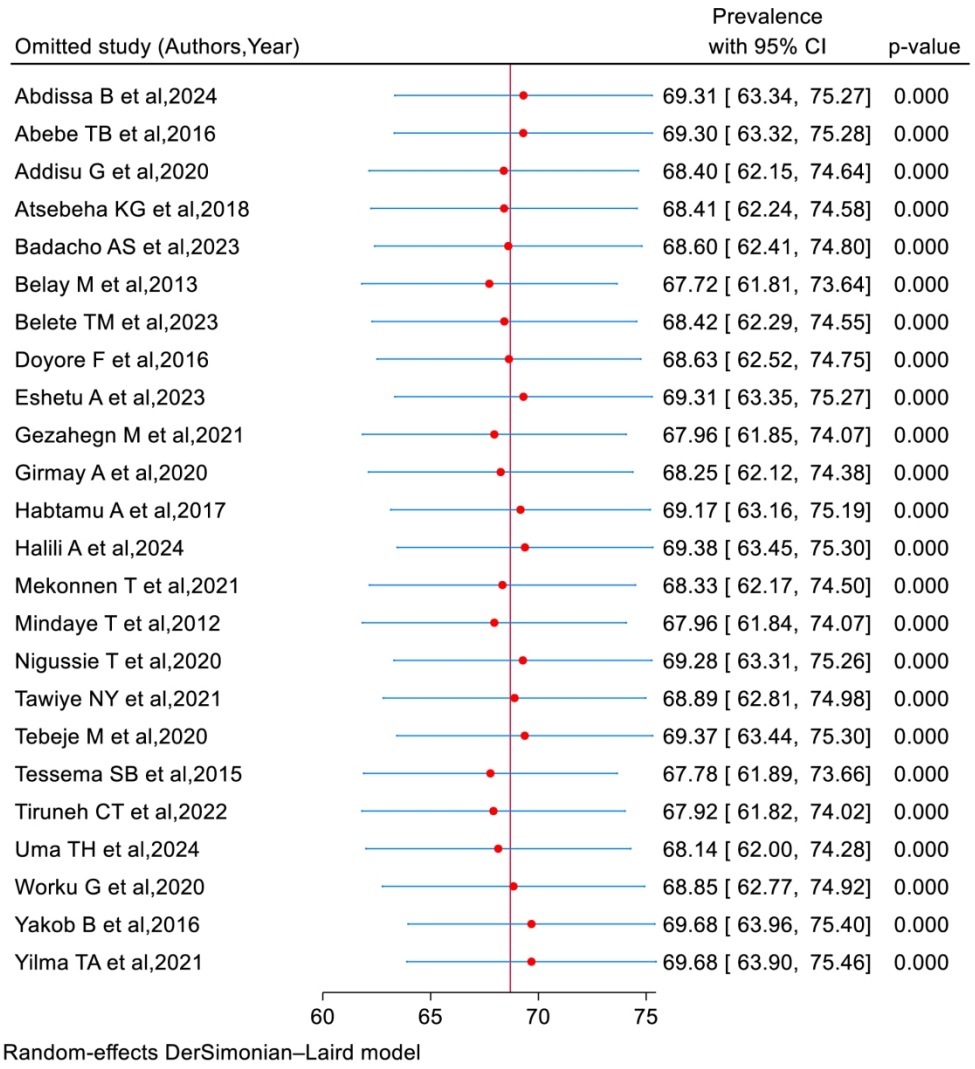
Supplementary figure 5. Forest plot showing subgroup analysis by Study setting included to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x219mm (300 x 300 DPI)



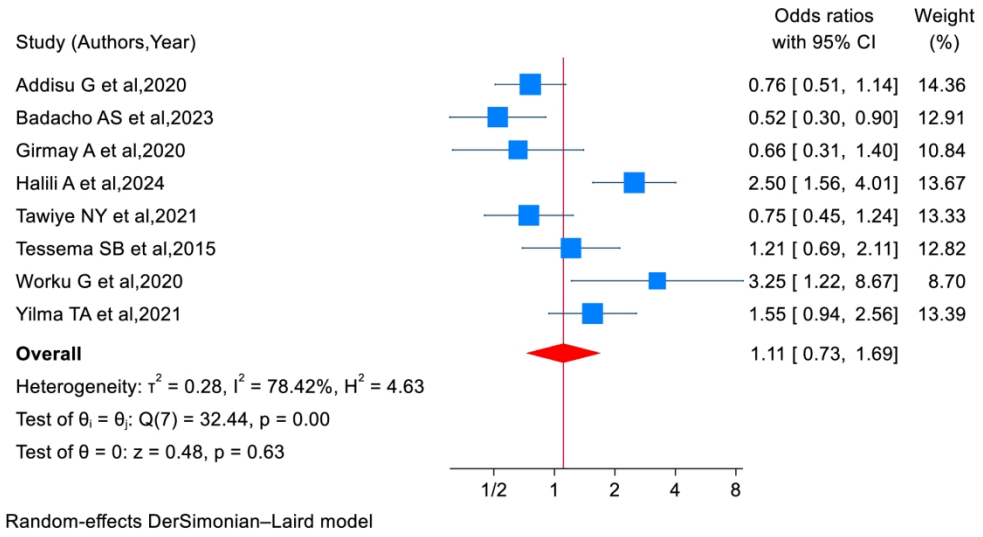
Supplementary figure 6. Forest plot showing subgroup analysis by sample size included to estimate the pooled prevalence of satisfaction with HIV/AIDS treatment and care services in Ethiopia.

165x212mm (300 x 300 DPI)



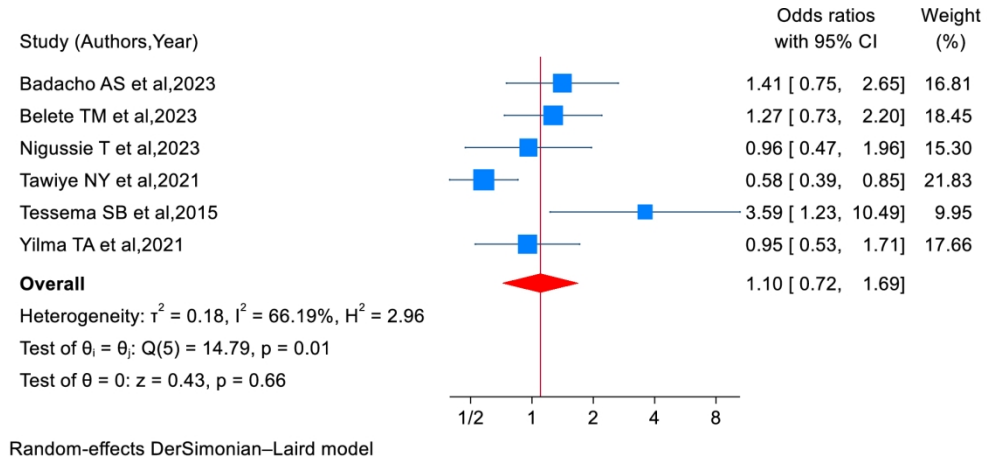
Supplementary figure 7. Sensitivity analysis of the prevalence of patient satisfaction with HIV/AIDS treatment and care services for each study being removed at a time: prevalence and 95% confidence level.

165x199mm (300 x 300 DPI)



Supplementary figure 8. The association between gender and Satisfaction with HIV/AIDS care and treatment services.

165x104mm (300 x 300 DPI)



Supplementary figure 9. The association between residence and Satisfaction with HIV/AIDS care and treatment services.

164x90mm (300 x 300 DPI)