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Treatment outcomes for substance use disorders across the African continent: a systematic review

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Abstract

Background Substance use disorders (SUDs) are increasingly recognized as a significant public health concern in Africa, placing considerable strain on the economy, healthcare system, and society at large. Given the dual disease burden of both infectious and non-communicable diseases, African countries may not prioritize addressing the emerging epidemic of SUDs. There is a paucity of scientific literature on SUD treatment outcomes following their management across the African continent. Therefore, this systematic review aimed to address this gap.

Methods We conducted an electronic search of Web of Science, CINAHL, Embase, Medline (PubMed interface), Scopus, and PsycArticles. We included studies with participants who were diagnosed and treated for SUDs following internationally recognized diagnostic criteria in the African region as defined by geographical boundaries and had at least one treatment outcome measured and reported. Studies were assessed for risk of bias using the Joanna Briggs Institute critical appraisal tool. This systematic review was registered in the PROSPERO database (CRD42022362926).

Results Thirteen research studies were included across four African countries (South Africa – 8, Uganda – 2, Zambia – 2, and the Democratic Republic of Congo – 1). The treatment completion rates across all treatment modalities averaged 71.4%. A reduction in substance use was reported in nine of the 13 studies, with significant decreases observed in measures such as heavy drinking days and substance use severity scores. However, relapse rates ranged from 23 to 92%, with predictors including low recovery capital and poor social support. Substitution behaviours, such as increased alcohol or crystal methamphetamine use, were noted in some studies following abstinence from primary substances.

Conclusions The findings suggest varying levels of efficacy for SUD treatment modalities in Africa, including reductions in substance use in some studies and moderate treatment completion rates. However, the high relapse rates underscore the need for comprehensive, resource-adapted interventions. The limited geographical scope of the literature, with studies predominantly from South Africa, points to a critical gap in research from other African countries and emphasizes the need for expanded research across the continent to inform scalable, evidence-based solutions for SUD management.

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Keywords Substance use disorders, Alcohol use disorders, Africa, Treatment

Background

Global impact of substance use disorders

Globally, substance use disorders (SUDs), characterized by the inability to control the use of substances such as alcohol or drugs and social impairment, are a significant public health concern, contributing substantially to disability-adjusted life years (DALYs) [1–3]. DALYs are a measure of overall disease burden in a population that combines years of life lost due to premature mortality and years lived with disability [4]. SUDs are associated with increased mortality and morbidity rates through infectious diseases (such as hepatitis and HIV), mental disorders, and non-communicable diseases such as cancers, cardiovascular diseases, and gastrointestinal disorders [5, 6] that impair daily functioning.

According to the 2024 World Drug Report, nearly 292 million individuals aged 15 to 64 used drugs in 2022, which is a 20% increase compared to a decade earlier [7]. The Global Burden of Disease Study [8] estimated that in the year 2017, approximately 585,000 deaths were reported due to drug use. Harmful use of alcohol contributes to about 3 million deaths each year [9] and over 300 million people are living with alcohol use disorders (AUDs) worldwide [10, 11]. While these global trends are alarming, the burden of SUDs has not spared the African continent and continues to grow exponentially, increasing their visibility as a major public health threat on the continent [11–13].

Substance use disorders in Africa

Africa's fast-growing population is accompanied by an increasing burden of SUDs, and by 2050 [14], the number of people who use drugs in sub-Saharan Africa is projected to surge by almost 150%, with 14 million new users. This trend indicates that Africa would have the greatest increase in the number of people who use substances worldwide by 2050 [14, 15]. The prevalence of illicit substances use, including cannabis (the most commonly used drug in Africa, with usage rates ranging between 5.2% and 13.5% in West and Central Africa), amphetamine-type stimulants, and benzodiazepines, is rapidly increasing [16]. Additionally, per capita alcohol consumption has risen significantly, along with the associated burden of disease [11, 17, 18]. At the same time, there has been an increase in the cultivation, trade, and use of cannabis across numerous African countries [11, 16, 19–21].

Factors that fuel the increase in SUDs in Africa include pervasive poverty, which, although it may limit access to substances due to the lack of disposable income, also contributes to distress, social exclusion, and limited access to education, all factors that are known to drive individuals towards substance use as a coping mechanism. Moreover, substance use can exacerbate economic hardship, creating a vicious cycle of poverty, substance use, resource scarcity, and further distress [22, 23]. Other factors include Africa having a predominantly young population, the continent's status as a significant hub for drug trafficking and production globally [24–26], and rapid urbanization [14]. These factors, among others, collectively heighten the likelihood of substance use. The high prevalence of SUDs in this region poses considerable concerns, as it not only causes immediate health risks but also has long-term consequences for both individuals and society [27–29]. In addition to the health burden, SUDs place a substantial economic strain on developing countries by increasing healthcare costs, reducing workforce productivity, and diverting limited resources away from other pressing needs [30, 31]. However, although Africa is clearly confronted with a growing substance use epidemic, related data on SUDs in the continent remains limited or insufficient. Many African nations face a lack of comprehensive national statistics on the epidemiology and usage patterns of various substances across different populations, leaving substantial gaps in understanding and addressing this pressing issue [16].

Management of substance use problems

Evidence-based treatments for SUDs have been well documented and range from brief behavioural therapies that can be delivered in individual and group formats to residential treatment and therapeutic communities, peer-led support, family treatments, harm reduction initiatives, and pharmacotherapy [32]. Historically, the understanding and management of SUDs in Africa have often been shaped by frameworks developed in high-income countries (HICs), which may not align with the sociocultural and economic realities of the African context. This disconnection has hindered the development of region-specific, culturally sensitive strategies for prevention, treatment, and harm reduction in African nations [33–35]. Moreover, a notable lack of attention from policymakers has further hampered service delivery [5, 18].

Efforts to prevent SUDs, provide treatment, and mitigate associated harm have further been constrained by competing health priorities such as addressing infectious diseases like malaria, tuberculosis, and HIV/AIDS, as well as the increasing burden of non-communicable diseases. These competing priorities, coupled with resource limitations and workforce shortages, have left SUD prevention and treatment services underfunded and underdeveloped. The inadequacies in access to effective and

equitable services for SUDs [36, 37] have been attributed to low prioritization of the problem [38], resulting in insufficient quality and availability of SUD treatment services [36, 39, 40]. The treatment gap for mental disorders in low and middle-income countries, including the African region, is estimated to be between 76 – 95% [41–44], with rural areas being the worst affected [42, 45] due to a lack of healthcare infrastructure and trained professionals [35, 46]. Consequently, more than two-thirds of those who could benefit from treatment are unable to access appropriate services [42].

In addition, strong extended family systems and communal social structures have traditionally served as informal support networks in many African societies, helping to protect individuals from social isolation and reduce engagement in risky behaviours, including substance use [47–50]. However, these protective social fabrics are increasingly eroded by factors such as war, displacement, urbanization, and changing cultural dynamics [47]. Westernization and societal atomization have diminished the buffering role of this social capital, exacerbating the treatment gap and vulnerability to SUDs [50, 51]. All these factors are likely contributors to high SUD relapse rates, which are reported to be over 50% [52–54]. Furthermore, social determinants such as poverty, illiteracy, and gender inequality contribute to disparities in accessing primary prevention, treatment, and harm reduction services [53, 55]. Additionally, stigma and normative cultural views in Africa further contribute to the complexity of treatment access [33, 40, 42, 56, 57]. The stigma surrounding SUDs in many African communities stems from deep-rooted beliefs that frame addiction as a moral failing rather than a medical issue. These attitudes limit individuals' willingness to seek help and have impeded the prioritization of SUD treatment in national health agendas [46].

Aims of the study

Numerous studies have explored treatment outcomes in the context of SUD management, encompassing diverse domains such as abstinence rates, reduction in substance use, retention in treatment programs, improvements in mental health and psychosocial functioning, reductions in risk behaviours, and enhancements in quality of life (QoL) [58, 59]. There is a notable lack of research on treatment processes and outcome monitoring in Africa due to, among others, resource, and time constraints on providers [60, 61]. This, in turn, hinders quality improvement efforts and contravenes good practices in SUD treatment.

The understanding of SUDs and their treatment is predominantly shaped by information from HICs, which creates a notable knowledge gap in the burden, risk factors, and management of SUDs in Africa [62]. This disparity leaves African regions poorly served in terms of developing effective interventions and culturally appropriate policies. Consequently, there is an urgent need for region-specific evidence and recommendations. To our knowledge, there is no systematic review available that provides a comprehensive analysis of outcomes of SUD treatment specifically in the African context. Therefore, we sought to address this gap by conducting a systematic review that focused on understanding treatment outcomes for SUDs as a key step in generating evidence for improving SUD treatment and addressing challenges in Africa.

Methods

This systematic review was conducted according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines [63]. The study protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO) database (CRD42022362926).

Search strategy

We sought studies published in English or French in peer-reviewed journals through Web of Science, CINAHL, Embase, Medline (PubMed interface), Scopus, and PsycArticles databases, first in July 2023 and subsequently in December 2024. Search terms were fitted to databases and included specific keywords referring to substance use, treatment interventions, treatment outcomes, and geographical areas (Africa). We considered all original research articles that met the criteria, with no consideration for the year of publication or study design. These broad searches allowed for the wide inclusion of potentially relevant articles. We then exported the references of these studies into Rayyan [56], a web-based tool designed for systematic review management. Duplicates were removed in Rayyan. The final search strategy for Medline appears in Table 1.

Eligibility criteria

We focused on original research articles that presented primary data on SUD treatment outcomes. Inclusion criteria were as follows: (1) individuals who were diagnosed and treated for SUDs, including but not limited to alcohol, opioids, cannabis, cocaine, amphetamines, and other psychoactive substances, following internationally recognized diagnostic criteria [64] regardless of age; (2) individuals who were treated in the African region as defined by geographical boundaries; (3) at least one treatment outcome was measured and reported; and (4) the data were published in a peer-reviewed journal.

Primary outcomes that were considered included treatment completion, substance use (abstinence and relapse), and mental health outcomes (quality of life [QoL] or depression or both). All service settings for receiving

Table 1 Search strategy as illustrated for medline database

#1	PROBLEM SUBSTANCE USE	"Substance-Related Disorders" [Mesh Terms] OR "alcoholic*" [TIAB] OR "alcoholism" [TIAB]
#2	PROBLEM SUBSTANCE USE	"alcohol" [TIAB] OR "drug*" [TIAB] OR "drug-related" [TIAB] OR "substance*" [TIAB] OR "substance-related" [TIAB] OR "substance related" [TIAB] OR "cannabis" [TIAB] OR "marijuana" [TIAB] OR "Phencyclidine" [TIAB] OR "PCP" [TIAB] OR "cocaine" [TIAB] OR "crack" [TIAB] OR "MDMA" [TIAB] OR "ecstasy" [TIAB] OR "amphetamine*" OR "meth" [TIAB] OR "methylamphetamine*" [TIAB] OR "methylamfetamine*" [TIAB] OR "speed" [TIAB] OR "methamphetamine*" [TIAB] OR "meth" [TIAB] OR "opioid*" [TIAB] OR "heroin" [TIAB] OR "ketamine" [TIAB] OR "benzodiazepine*" [TIAB] OR "benzo*" [TIAB] OR "oxycodone" [TIAB] OR "Z-drug*" [TIAB] OR "morphine" [TIAB] OR "mushroom*" [TIAB] OR "vicodin" [TIAB] OR "LSD" [TIAB] OR "Lysergic acid diethylamide" [TIAB] OR "peyote" [TIAB] OR "mescaline" [TIAB] OR "psilocybin" [TIAB] OR "tramadol" [TIAB] OR "hallucinogen*" [TIAB]
#3	PROBLEM SUBSTANCE USE	"use" [TIAB] OR "user*" [TIAB] OR "using" [TIAB] OR "use-disorder*" OR "abuse*" [TIAB] OR "abusing" [TIAB] OR "dependent*" [TIAB] OR "dependenc*" [TIAB] OR "depending" [TIAB] OR "disorder*" [TIAB] OR "problem*" [TIAB] OR "addict*" [TIAB]
#4	TREATMENT INTERVENTION	"Therapeutics"[Mesh Terms] OR "Treatment outcome" [Mesh Terms] OR "treatment*" [TIAB] OR "intervention*"[TIAB] OR "program*"[TIAB] OR "therap*"[TIAB] OR "service*"[TIAB] OR "counseling"[TIAB]
#5	OUTCOME	"Alcohol Abstinence" [Mesh Terms] OR "Recurrence" [Mesh Terms] OR "Quality Of Life" [Mesh Terms] OR "abstinence"[TIAB] OR "sobriet*"[TIAB] OR "discontinuatuon"[TIAB] OR "drug-free"[TIAB] OR "alcohol-free"[TIAB] OR "relapse*" [TIAB] OR "Recurrence" [TIAB] OR "Setback*" [TIAB] OR "slip*"[TIAB] OR "QoL"[TIAB] OR "quality of life"[TIAB] OR "Well-being"[TIAB]
#6	AFRICA	"Africa" [Mesh Terms] OR "Africa"[TIAB] OR "African*"[TIAB] OR "Algeria"[TIAB] OR "Angola"[TIAB] OR "Benin"[TIAB] OR "Botswana"[TIAB] OR "Burkina Faso"[TIAB] OR "Burundi"[TIAB] OR "Cabo Verde"[TIAB] OR "Cameroon"[TIAB] OR "Central African Republic"[TIAB] OR "Chad"[TIAB] OR "Comoros"[TIAB] OR "Congo"[TIAB] OR "Democratic Republic of Congo"[TIAB] OR "Djibouti"[TIAB] OR "Egypt"[TIAB] OR "Equatorial Guinea"[TIAB] OR "Eritrea"[TIAB] OR "Eswatini"[TIAB] OR "Ethiopia"[TIAB] OR "Gabon"[TIAB] OR "Gambia"[TIAB] OR "Ghana"[TIAB] OR "Guinea"[TIAB] OR "Guinea-Bissau"[TIAB] OR "Ivory Coast"[TIAB] OR "Côte d'Ivoire"[TIAB] OR "Kenya"[TIAB] OR "Lesotho"[TIAB] OR "Liberia"[TIAB] OR "Libya"[TIAB] OR "Madagascar"[TIAB] OR "Malawi"[TIAB] OR "Mali"[TIAB] OR "Mauritania"[TIAB] OR "Mauritius"[TIAB] OR "Morocco"[TIAB] OR "Mozambique"[TIAB] OR "Namibia"[TIAB] OR "Niger"[TIAB] OR "Nigeria"[TIAB] OR "Rwanda"[TIAB] OR "Sao Tome and Principe"[TIAB] OR "Senegal"[TIAB] OR "Seychelles"[TIAB] OR "Sierra Leone"[TIAB] OR "Somalia"[TIAB] OR "South Africa"[TIAB] OR "South Sudan"[TIAB] OR "Sudan"[TIAB] OR "Tanzania"[TIAB] OR "Togo"[TIAB] OR "Tunisia"[TIAB] OR "Uganda"[TIAB] OR "Zambia"[TIAB] OR "Zimbabwe"[TIAB])
#7	AFRICAN AMERICAN	"African-American"[TIAB] OR "African American"[TIAB]
#8		((#1 OR (#2 AND #3)) AND #4 AND #5 AND #6) NOT #7

treatment were considered, including outpatient and residential services and community-based interventions.

We excluded studies that did not meet the predefined inclusion criteria. We excluded studies that were literature reviews, editorials, or gray literature. Studies that failed to align with the review's objectives or with unavailable full texts were also excluded.

Study selection

The initial phase of study selection was conducted by two independent reviewers (CB and DM), who screened the titles and abstracts of the identified articles to assess their eligibility. All identified studies from the search were imported into Rayyan [65], to facilitate the removal of duplicates and apply filters, such as geographical location and study type. Any discrepancies between the reviewers were resolved through discussion. Duplicates were removed via automatic and manual screening. Papers considered as potentially relevant were retained and their full-texts were checked by the two reviewers (CB and DM). We further screened the reference lists of included studies to assess whether more studies were eligible for this review. The percentage of agreement between the two reviewers (CB and DM) was 92%, with a Cohen's Kappa statistic of 0.89, indicating a strong level of agreement.

Assessment of Bias

Each study that was included was assessed for bias by the two reviewers (CB and DM) via the Joanna Briggs Institute (JBI) Critical Appraisal Tools for Systematic Reviews (see Table 2). The JBI assessment of bias in systematic reviews for cross-sectional studies and cohort studies was used [66, 67]. Studies were categorized as having a high risk of bias if the proportion of positive answers to the bias assessment questions was 49% or lower. A moderate risk of bias was assigned to studies with a proportion of positive answers between 50% and 69%. Conversely, studies were classified as having a low risk of bias if the proportion of positive answers exceeded 70%.

Data extraction

Microsoft Excel was used for data extraction. The review team produced a data extraction form to collect the relevant data. For all the studies that met the inclusion criteria, two reviewers entered data in the following fields: authors; title; country of study; year published; journal; number and demographic characteristics of participants; types of services received; period of the study; types of substances used; management of SUDs; and treatment outcomes. We identified the following treatment outcomes of interest from the studies included: treatment completion, substance use (abstinence and relapse),

Table 2 Risk of bias using the Joanna Briggs Institute appraisal tools for systematic reviews

Name of Author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	%	Risk
Vagheni et al., 2022	Y	Y	N	Y	N	Y	Y	Y	Y	78%	Moderate
Myers et al., 2010	Y	Y	Y	Y	N	Y	Y	Y	Y	89%	Low
Calligaro et al., 2021	Y	Y	Y	Y	N	Y	Y	Y	Y	89%	Low
Saban et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	Low
Kalema et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	Low
Bwalya, 2022	Y	Y	Y	Y	N	Y	N	N	Y	67%	Medium
Sinclair et al., 2021	Y	Y	Y	Y	N	Y	Y	Y	Y	89%	Low
Gouse et al., 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	Low
Myers et al., 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	Low
Sheikh, 2016	Y	Y	Y	Y	Y	Y	N	N	Y	78%	Medium
Morgan et al., 2019	Y	Y	Y	Y	Y	N	Y	Y	Y	89%	Low
Ertl et al., 2021	Y	Y	Y	N	Y	Y	N	Y	Y	78%	Medium
Khan et al.,2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	Low

and mental health outcomes (quality of life (QoL) or depression or both). Once these data were extracted by the reviewers, the findings were analysed and reported narratively.

Results

Study selection findings

Database searches yielded 3654 records that were uploaded to Rayyan.ai. A total of 1595 duplicates were excluded, and 2059 papers were independently screened based on title and abstract by CB, FDM, and DM. A total of 1975 studies were unanimously excluded at the title and abstract screening level because they did not meet all eligibility criteria. Reasons for exclusion included a focus on non-human populations, study type (e.g., i.e. systematic reviews, meta-analyses, books), geographical region, and topics outside the scope of SUDs. The exclusion criteria were applied systematically to maintain the relevance and rigour of the review process.

The full texts of the remaining 84 records were reviewed in detail. Seventy-four studies were excluded because they were not conducted on the African continent, did not include populations with SUDs, or did not report any treatment outcomes. Ten studies were yielded from the database search, and three additional papers were added based on searching bibliographies of the included studies (see Fig. 1). All papers were thoroughly reviewed to identify core findings related to the treatment modality and outcomes. Information was extracted and thematically compiled for synthesis.

Risk of bias

Most of the included studies exhibited a low risk of bias, as indicated by a high percentage of positive responses to the questions in the JBI tool, and only three studies were indicated as having a moderate risk of bias (see Table 2).

Q1. Were the criteria for inclusion in the sample clearly defined? Q2. Were the participants free of the outcome at the start of the study? Q3. Were the study subjects and the setting described in detail? Q4. Were the outcomes measured in a valid and reliable way? Q5. Was the follow-up time reported and sufficient to be long enough for outcomes to occur? Q6. Was follow-up complete, and if not, were the reasons for loss to follow-up described and explored? Q7. Were confounding factors identified? Q8. Were strategies to address confounding factors stated? Q9. Was appropriate statistical analysis used?

- Y = Yes.
- N = No.
- U = Unclear.
- NA = Not applicable.

Study characteristics

The review included thirteen studies from four countries, eight from South Africa, two from Uganda, two from Zambia, and one from the Democratic Republic of Congo (see Fig. 2). Except for South Africa, there was a notable absence of literature on SUD treatment outcomes across much of Africa.

The included studies employed a variety of research designs. Roughly half of the 13 studies adopted a prospective cohort design [68–73], which involved the longitudinal tracking of individuals undergoing treatment for SUDs to assess outcomes. Two studies implemented a cross-sectional study design [45, 74], and two were retrospective studies that used existing records to assess SUD treatment outcomes [75, 76]. One of the studies used a trial design of an uncontrolled, single-arm feasibility test combining motivational interviewing (MI) and relapse prevention (RP) [77], and two other studies applied a randomized controlled trial design [78, 79].

The sample size of the included studies ranged between 20 and 1094 participants, with a mean sample of 265 across the 13 studies. Three types of outcomes were assessed in all the studies: treatment completion,

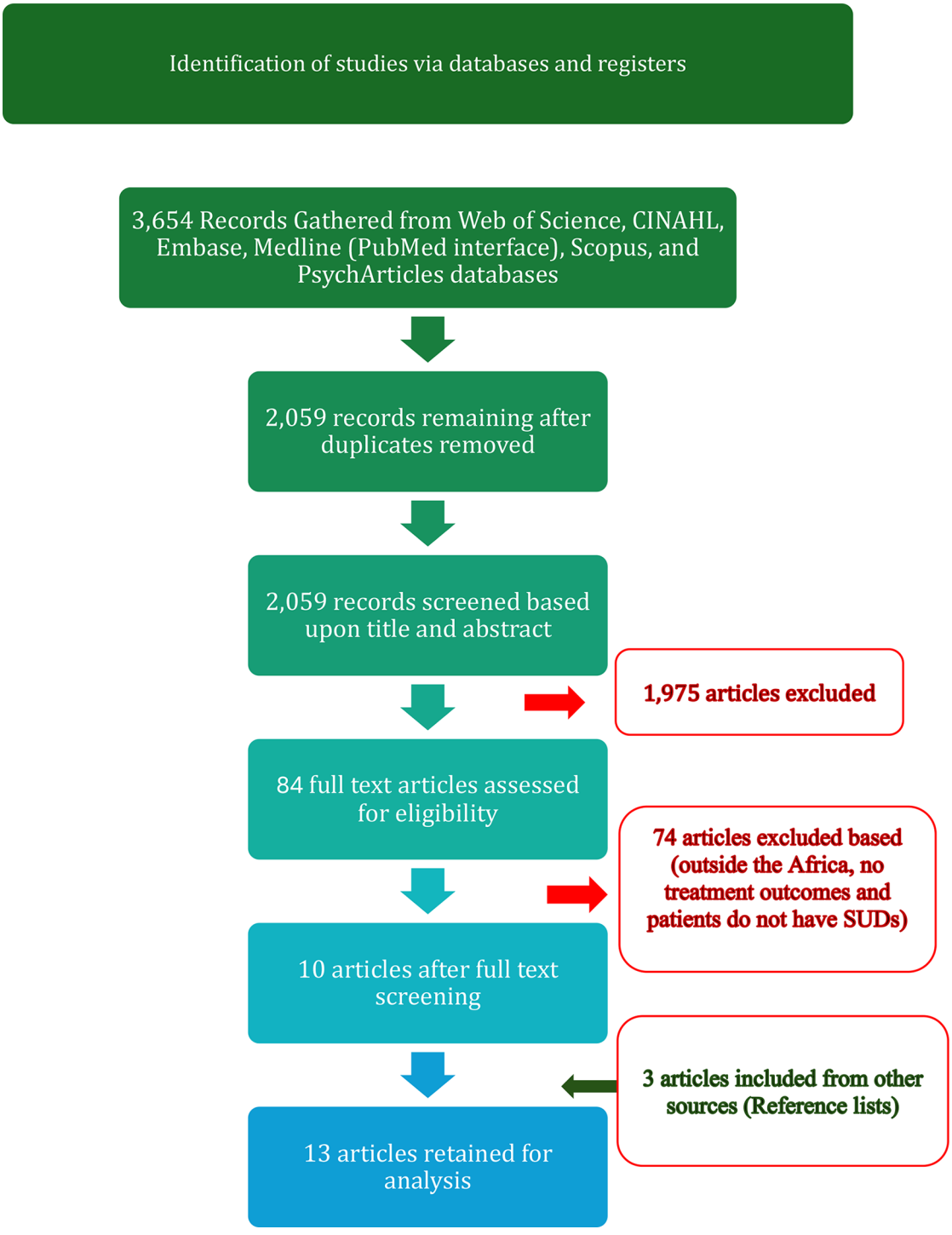


Fig. 1 Selection of the studies

substance use (abstinence, relapse, reductions in substance use), and mental health (QoL or depression or both) (see Table 3).

Participant characteristics

The mean age of participants in the studies was 29.2 years [95% CI: 21.4, 37.1]. While specific cohorts were targeted in some studies, such as adolescent patients [74] and individuals with concurrent infectious comorbidities [61], the majority (eleven out of 13 studies) encompassed broader populations representative of those seeking treatment for SUDs. Notably, the study by Calligaro and colleagues [77] included patients with AUDs and multidrug-resistant tuberculosis.

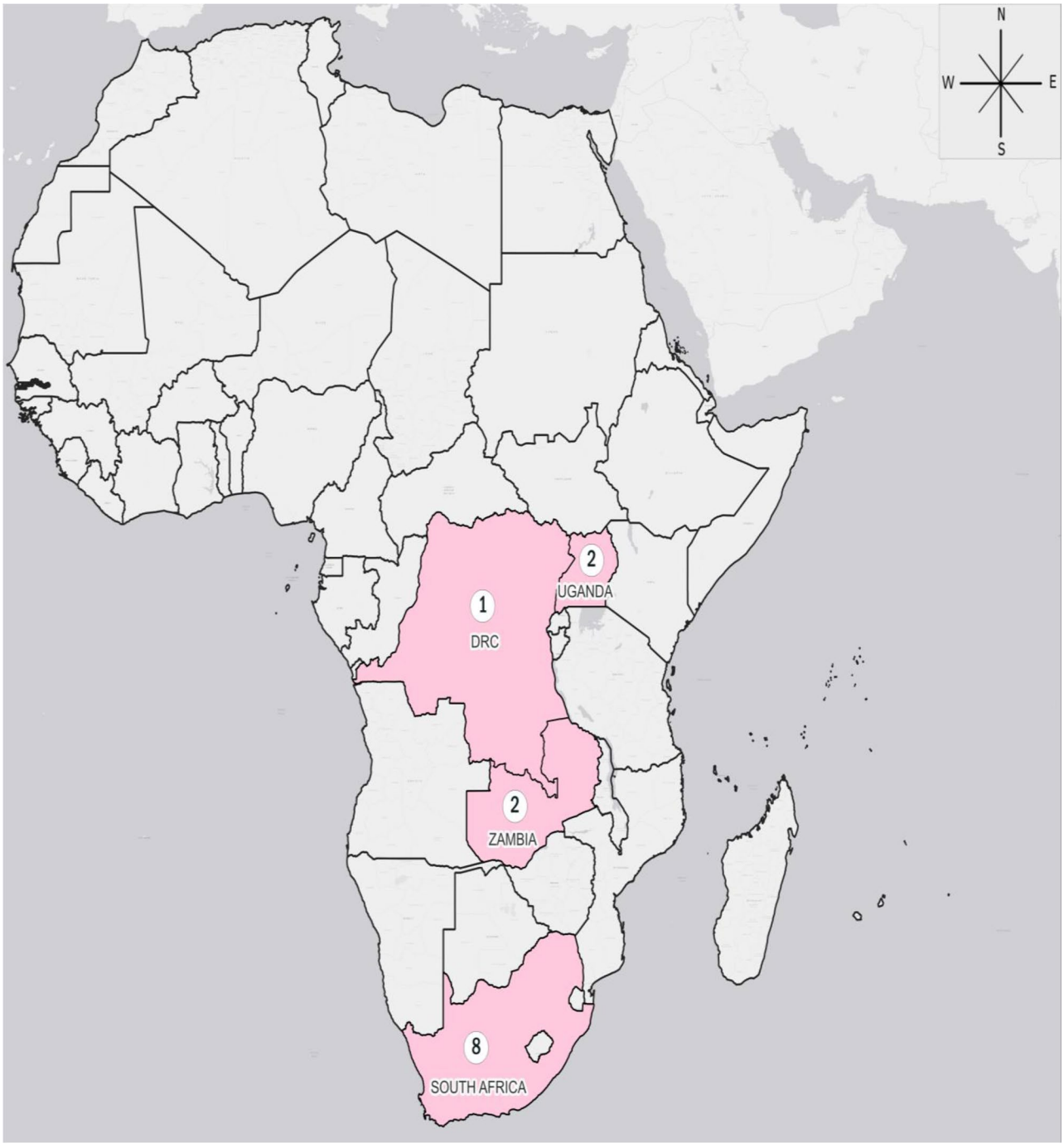


Fig. 2 Overview of African countries indicating the number of studies included

Management of substance use disorders

Different treatment modalities were reported across various studies including a mix of outpatient, residential, and detoxification approaches, often constrained by resource limitations. Outpatient programs, such as those based on the Matrix Model, emphasized structured programs with RP, cognitive-behavioural therapy (CBT), and MI. According to Myers and colleagues [70], a large proportion of the participants (61.3%) received outpatient services for SUDs. Treatment modalities included behavioural and psychosocial programs such as CBT, MI, and 12-step facilitation. Gouse and colleagues [75] reported outpatient programs that followed the Matrix Model, featuring 16 weeks of structured therapy, including early recovery sessions and RP groups. Clients typically attended 2-4 sessions per week, with random drug

Table 3 Characteristics of included studies

Author	Country	Study design	No. of patients	Average age	Treatment setting	Substance	Treatment completion	Decreased Substance Use	Relapse	Depression
Calligaro, et al. (2021)	South Africa	Clinical Trial	40	36.3	Hospital based, Relapse prevention	Mixed substances	32	Median ASSIST scores decreased from 17.5 to 6 at follow-up	-	CES-D score lower post-intervention [23.5 (18–34) vs. 17 (13–22)]
Vagheni et al.(2022)	DRC	Cross-sectional study	20	16.1	Not specified	Mixed substances	-	NA	17	-
Myers et al. (2010)	South Africa	Cross-sectional study	434	24.88	Outpatient department, Residential & Hospital based services	Mixed substances	298	NA	-	-
Saban et al. (2014)	South Africa	Prospective cohort study	95	23	Residential treatment	Mixed substances	70	No. of persons decreased from 83 to 35	46	No. of persons depressed reduced from 24 to 19
Sinclair et al. (2021)	South Africa	Prospective cohort study	137	32.1	Residential treatment	Mixed substances	-	Not specified	32	-
Myers et al. (2018)	South Africa	Prospective cohort study	1094		Out patient Department & Residential treatment	Mixed substances	644	48% considered abstinent on treatment exit	-	-
Kalema et al. (2019)	Uganda	Prospective cohort study	78	31.6	Residential treatment	Alcohol	-	Recent heavy drinking days reduced from a mean of 20.7 to 2.4 Recent expenditure on alcohol reduced from 204.43 to 36.43 USD	-	Depression reduced from 28.4 to 23.5
Ertl et al. (2021)	Uganda	Prospective cohort study	25	40.6	Community based intervention	Alcohol	19	Number of patients taking alcohol 4 or more times a week reduced from 19 to 4 at 5month follow-up and 2 at 12 month follow-up	23	-
Morgan et al. (2019)	South Africa	Prospective cohort study	300	27	Inpatient detoxification and Residential treatment	Heroin	-	34.5% were not using Heroin at follow-up	197	-

Table 3 (continued)

Author	Country	Study design	No. of patients	Average age	Treatment setting	Substance	Treatment completion	Decreased Substance Use	Relapse	Depression
Bwalya et al. (2022)	Zambia	Randomized controlled trial	50	-	Outpatient Department	Alcohol	-	Mean drinking frequency reduced from 3.64 to 2.92 Mean amount of drinking reduced from 3.4 to 2.52 Intervention Mean drinking frequency reduced from 3.76 to 0.28 Mean amount of drinking reduced from 2.96 to 0.2	-	-
Sheikh et al. (2016)	Zambia	Randomized controlled trial	114	32	Residential treatment	Alcohol		Intervention group • Average AUDIT scores reduced from 10.2 before treatment to 1.3 at follow-up. • Average time to first drink was 51 days Non– intervention group • Average AUDIT scores reduced from 10.3 before treatment to 8.9 at follow-up. • Average time to first drink was 10 days	-	-
Gouse et al. (2016)	South Africa	Retrospective study	986	28.3	Outpatient Department		129	-	-	-
Khan et al.	South Africa	Retrospective study	70	29	Residential treatment	Heroin	61	28 abstinent 26 (37%) reported being completely abstinent since index admission.	38	-

testing to monitor progress. Bwalya and colleagues [78] integrated weekly therapy sessions provided in outpatient settings, while Calligaro and colleagues [77] combined MI and RP to address triggers, manage high-risk situations, and develop cognitive-behavioural strategies during outpatient engagements.

Four of these used a variety of specialized SUD treatment modalities, including residential treatment where patients resided at a facility for varying periods and received other therapies such as individual counselling, group therapy, medical supervision, and hospital-based intensive treatment [68–70, 80]; three of these also offered outpatient treatment services [70, 75, 80]. Kalema and colleagues [71] and Khan and colleagues [76] reported short-term residential programs where patients were admitted for brief stays (1–2 weeks) focusing on detoxification and brief psychosocial counselling. Longer-term residential services were reported by Morgan and colleagues [73] where the facility offered a one-week detoxification process followed by 6-8 weeks of group therapy using the 12-step approach. Sinclair and colleagues [69] reported residential programs that incorporated individual and group therapy and pharmacological treatments. Notably, in some studies, a fraction of the participants received detoxification-only services [70, 80] without additional therapeutic interventions.

Sheikh and colleagues [79] reported on residential programs that comprised mainly detoxification provided over a week for the control group participants while the intervention group received the same standard treatment along with a brief RP intervention from the WHO Mental Health Gap Action Programme (mhGAP). This intervention included the involvement of a close family member to enhance support.

Ertl and colleagues [72] reported treatment modalities that included community-based programs in the form of specialized camps that included a one-week intensive inpatient detoxification program complemented by psychotherapeutic content, followed by optional counselling or peer support through Alcoholics Anonymous (AA) groups [72].

Types of substances used

Alcohol was the most frequently reported substance used across the studies and 'substance of choice'. Five of the 13 studies involved interventions focused specifically on AUDs [71, 72, 78, 79]. The remaining eight studies assessed outcomes for various substances, including alcohol, cannabis, crack/cocaine, ecstasy, heroin, methaqualone, crystal methamphetamine, and amphetamines [60, 68–70, 74, 75, 77]. Substances such as CAT, cigarettes, and other synthetic drugs were occasionally mentioned under "other substances".

Follow-up intervals

The follow-up period of the participants varied across studies, from one to 12 months. Shorter follow-up periods (1–3 months) were primarily used to evaluate immediate treatment outcomes [68, 70]. Longer follow-up periods (6–12 months) provided more comprehensive data on sustained recovery and overall improvement in QoL [69, 71, 72, 75, 77, 81].

Treatment outcomes

The included studies reported a range of treatment outcomes, which were categorized into treatment completion, substance use (abstinence, relapse, and reductions in expenditure on substance use), and mental health outcomes, including depression, and QoL.

Treatment completion

Most studies (11 of the 13) reported treatment completion, specifically as a proxy indicator of positive treatment outcomes. The average treatment completion rate across all studies was 71% (CI: 53.1 – 89.7%) ranging from 13 to 100%. A study by Myers and colleagues [70] revealed that poor treatment perceptions and satisfaction, lack of social support, and depression were significant predictors of treatment non-completion. However, Saban and colleagues [68] reported sociodemographic characteristics that were associated with treatment completion as being single and male, citing increased time available to complete treatment due to reduced domestic responsibilities compared with their female counterparts.

Abstinence

Abstinence was reported in five studies [69, 70, 73, 76, 79]. Abstinence rates were less than 50% according to the findings in three studies, who assessed abstinence via self-report measures in South Africa. Sinclair and colleagues [69] reported abstinence among 40% of those admitted to residential treatment in a post-treatment period that ranged from one to four months, whereas Myers and colleagues [70] reported a 48% abstinence rate at treatment exit, with individuals in residential programs significantly more likely to achieve abstinence than those in outpatient services. Morgan and colleagues [73] found a much lower abstinence rate of 6.3% among people who used heroin.

Khan and colleagues [76] reported a higher long-term abstinence rate, with 55% of participants currently abstinent four years after admission to an opioid detoxification unit, though the authors caution that abstinent individuals may have been more easily reachable than active users. Social support from close friends and family and self-funded oral substitution therapy were identified as key factors in maintaining abstinence.

Sheikh and colleagues [79] assessed abstinence through the principal outcome measure of the number of days participants remained abstinent after discharge from their treatment program. The results indicated that the intervention group achieved significantly longer periods of abstinence, with an average time to first drink of 51 days (standard deviation = 14), compared to just 10 days (standard deviation = 16) for the non-intervention group. Statistical analysis revealed a significant difference between the two groups demonstrating the effectiveness of incorporating RP and family involvement in extending abstinence durations which was done in the intervention group.

Reduction in substance use

Six of the 13 studies further reported a statistically significant reduction in substance use during follow-up periods, irrespective of the treatment modality, population, or follow-up duration, indicating favourable treatment outcomes. The measures used to assess the reduction in the use of substances included the ASSIST (Alcohol, Smoking, and Substance Involvement Screening Test) [82], the AUDIT (Alcohol Use Disorders Identification Test) [83] and the Addiction Severity Index [84]. Calligro and co-authors [77] reported that ASSIST baseline scores decreased from an average of 17.5 to 6.0 indicating reduced substance use severity [77].

Saban and colleagues observed a decline in the number of individuals using substances from 83 to 35 over the treatment period. Kalema and collaborators [71] demonstrated reductions in the average number of heavy drinking days from a mean of 20.7 to 2.4 days and a significant reduction in the frequency of those who drank daily from 59 to 8% at the 6-month follow-up period [71]. Additionally, Ertl and colleagues [72] reported significant reductions in the number of participants reporting alcohol intake four times or more weekly, decreasing from 19 individuals to 4 at the five-month follow-up and further decreasing to two participants by the 12-month follow-up period [68]. Kalema and colleagues [71] reported significant reductions in alcohol expenditure from 203,430 to 36,430 Ugandan shillings (58.1 USD to 10.4 USD) at the six-month follow-up.

Sheikh and colleagues [79] showed significant improvements in AUDIT scores for alcohol intake frequency at an 8-week follow-up post-discharge, with the intervention group scoring an average of 1.3 compared to 10.2 before treatment and the non-intervention group scoring an average of 8.9 compared to 10.3 before treatment. Bwalya and colleagues [78] highlighted notable reductions in drinking behaviours. In the intervention group, drinking frequency fell from 3.76 to 0.28, the amount consumed dropped from 2.96 to 0.2, and the frequency of consuming six or more drinks declined from 3.44 to 0.16.

Relapse

Sinclair and co-investigators [69] defined relapse as any post-treatment use of the primary substance(s) and reported a rate of 23.4% at the 3-month follow-up period, which was much lower than that reported in other included studies [69]. The study by Ertl and colleagues [72] reported relapse rates of 92% at least once during the follow-up period, whereas the study by Vagheni and colleagues [74], which assessed predictors of relapse among adolescents with mental illness, reported 85% relapse rates in that cohort [72, 74]. The predictors of relapse included low recovery capital, which was characterized by a low educational level, low self-esteem, poor perceived social support, and living in rural areas, which highlighted poor access to health services. The study by Saban and fellow researchers [68] reported relapse rates of approximately 48.3%, and except for the use of crystal methamphetamine as an initiating substance, there was no significant difference in other variables when those who relapsed and those who did not were compared. Khan and colleagues [76] reported that most participants relapsed within three months after index detoxification and rehabilitation at a rate of 54%.

Substitution was an outcome measure reported by Sinclair and colleagues [69], defined as an increase in the use of an alternative substance, engagement in other behaviours, or both, following abstinence from the primary substance(s). The substitution rate in this residential cohort was estimated to be 36.5%. A broad definition of substitute substances/behaviours was applied, with potential substitutes including love, caffeine, eating, exercise, cigarettes, and social networking; many participants reported multiple substitutes [64].

Morgan and colleagues reported an increase in the use of other substances among people who use heroin, which could indicate substitution with another substance. Alcohol use rose significantly from 17.1% at baseline to 55.2% at follow-up, and daily alcohol use increased substantially from 2.5% at enrolment to 25.8% at follow-up among the participants. Similarly, crystal methamphetamine use in the past month increased from 16.7% at baseline to 23.4% at follow-up.

Depression and quality of life

Four of the 12 studies reported severity of depression as an outcome [68, 71, 77, 81]. Calligaro and colleagues [77] reported a reduction in depressive symptoms three months after hospital discharge, with a median (IQR) CES-D score that was significantly lower post-intervention [23.5 (18–34) vs. 17 (13–22)].

Ertl and colleagues reported an initial reduction in symptoms of depression at the five-month follow-up; however, the reduction was not maintained, and at the 12-month follow-up, this improvement was reversed [72].

QoL was measured by Kalema and colleagues [71] who used the WHOQOL–BREF instrument. The overall QoL improved from an average score of 57.4 to 68.5 after six months of follow-up after residential treatment. Calligaro and colleagues [77] assessed health-related QoL via the EuroQol-5 Dimensions 3 Level (EQ-5D 3 L) instrument. The median score at baseline was 5.5, whereas the median score at follow-up was 5.0.

Discussion

This systematic review of thirteen studies aimed to assess SUD treatment outcomes across the African continent. To the best of our knowledge, this is the first review that provides an overview of studies on SUD treatment modalities and outcomes in Africa, addressing a critical gap in the literature.

The rigorous screening process of this review resulted in the inclusion of 13 studies, with the majority (8/13) conducted in South Africa. This research concentration reveals an underrepresentation of SUD treatment research across the continent. This geographic disparity highlights a critical gap in the evidence base for SUD treatment in Africa, underscoring the urgent need for continent-wide efforts to bridge this knowledge gap. To address this void, regional and international research

collaboration should be fostered to support capacity building and adequate resource allocation.

Additionally, the limited geographical representation of studies raises important concerns about the generalizability of the findings to the broader African context. Variability in substance use patterns, healthcare infrastructure, and sociocultural factors across the continent requires country and region-specific data. Additionally, various research designs were employed, including prospective cohorts, cross-sectional studies, retrospective analyses, and randomized controlled trials, providing a diverse but fragmented evidence base. The sample sizes and follow-up durations varied significantly, making direct comparisons across studies challenging.

Substantial heterogeneity was also observed in the treatment modalities employed in the studies included in this review. Treatment services included outpatient services, residential centres, hospital-based treatment programs, RP programs, and community-based interventions. Outpatient services emerged as prominent treatment modalities across studies, reflecting the importance of improving access to SUD treatment in Africa, where there is inadequate health infrastructure, competing financial priorities, and geographical location as major barriers to residential treatment services [45, 85]. It is important to note that until recently, SUDs were often overlooked and did not receive the same level of global health prioritization as communicable diseases and specific non-communicable diseases such as cancers, heart diseases, and hypertension, among others. This resulted in the neglect of the provision of services dedicated to SUDs and their segregation from mainstream healthcare, with resource allocation that did not match the significant burden these disorders impose [38].

Most included studies focused on the general adult population, with a few focusing on specific populations. Vagheni and colleagues [74] specifically focused on assessing the prevalence and predictors of relapse among the adolescent population while Calligaro and colleagues [77] assessed SUD treatment outcomes among multidrug-resistant TB patients. These studies demonstrated the successful adaptation of integrated SUD interventions into broader healthcare frameworks, addressing co-occurring medical conditions such as MDR-TB and HIV/AIDS. Integrating SUD management in primary healthcare settings may enhance access, reduce stigma, and align with recommendations to narrow the SUD treatment gap [86], particularly in resource-constrained settings. Moreover, this integration offers additional benefits through optimizing and utilizing existing healthcare infrastructure and resources, for example, by streamlining care delivery processes and incorporating SUD management into routine healthcare encounters for other medical conditions, such as HIV/AIDS, tuberculosis, and non-communicable diseases.

Furthermore, such integration means that healthcare systems address SUDs at an earlier stage, preventing complications and improving health outcomes [87, 88]. The World Health Organization (WHO), through its Mental Health Gap Action Program, has developed intervention guidelines supporting the integration of mental health and SUD treatment into general and primary healthcare settings [89].

Diverse outcome measures (encompassing treatment completion, substance use, and QoL) complicated direct comparisons between studies. While the temporal dynamics of SUD recovery are evident, future research could benefit from standardized outcome measures and follow-up durations for more cohesive understandings of treatment trajectories, to enhance comparability between studies, and facilitate the development of tailored evidence-based guidelines and interventions. Yet, it is important to acknowledge that flexibility in outcome measures and follow-up durations may be warranted to accommodate the diverse needs and contexts of SUD populations across different settings.

Most included studies reported substantial reductions in substance use at follow-up, providing optimistic insights into the efficacy of diverse treatment modalities. However, failure to complete treatment, relapse, and continued substance use were also reported. The average treatment completion rate reported in the studies was 71%, and treatment drop-out was attributed to poor treatment perceptions, lack of social support, poor satisfaction with SUD treatment services, and sociodemographic characteristics [70, 80]. Slightly lower completion rates have been reported in systematic reviews comprising HICs [90, 91]. Other studies in HICs have identified social support, including financial stability, stable employment status, and reliable support networks, as major predictors associated with treatment completion [92, 93]. However, other influential factors, such as previous treatment participation, prior drug and alcohol education class attendance, and involvement in court-directed programs, have also been associated with treatment completion [92–94].

Relapse rates varied from as low as 23% in Sinclair and colleagues' study [69] to as high as 92% in Ertl and colleagues' study [72]. Relapse was predicted by factors such as recovery capital, type of substance use, and demographic characteristics [72, 74]. Recovery capital has previously been reported as a predictor of sustained recovery and satisfaction with treatment [95]. In most studies, relapse was measured as a discrete outcome, but there is a need for further research on patterns of relapse, time intervals, and protective factors from treatment to relapse [69, 72, 74, 75] to augment understanding of

when to intensify post-treatment support and RP interventions. Various authors have identified case management and continuity of care as important strategies to enhance treatment outcomes and linkages to ongoing support [96].

Though an underexplored outcome, the phenomenon of 'substance substitution' indicated that patterns of substance or behaviour change post-treatment, highlighting the need for more comprehensive assessments beyond conventional outcomes indicators [69]. Morgan and colleagues [73] reported increased use of substitute substances like alcohol and methamphetamine among participants who were initially using heroin, indicating a shift rather than a resolution of the SUD. While substitution behaviour is not commonly investigated in SUD treatment studies, it is a relevant and necessary outcome to be considered, particularly in settings with limited access to treatment options. In such contexts, individuals may resort to alternative substances or behaviors as a coping mechanism, particularly in early recovery. Consequently, it is important to understand the adaptive strategies individuals employ post-treatment to better comprehend long-term treatment success and develop comprehensive recovery approaches that account for substitution behaviours.

Finally, the assessment of depression symptoms and QoL in the included studies revealed positive and complex trends. Reductions in depressive symptoms were noted with variations over time [71, 77], similar to findings reported in other studies conducted in Norway and Australia [97, 98]. The use of different scales for measuring QoL, such as the WHOQOL-BREF and the EQ-5D 3-L, made comparisons of these studies difficult. It is recommended to include standardized measures of subjective well-being in outcome studies, as well as other patient-reported outcomes to improve the quality of care as perceived by service users and to guide service development and improvement [99].

Limitations

The restriction to reviewing published studies may have introduced a publication bias, as studies with positive or statistically significant results are more likely to be published. This may lead to overestimating positive treatment outcomes and a limited representation of studies with null or negative findings. However, the authors of this review are not aware of other unpublished outcome studies on the African continent.

Most of the included studies were conducted in South Africa, limiting the generalizability of the findings to other countries and settings within this continent. Variations in healthcare infrastructure, cultural norms, and socioeconomic factors may affect the applicability of the reported outcomes across diverse African populations.

Despite these limitations, this systematic review provides a comprehensive synthesis of existing evidence on treatment outcomes for SUD management in Africa, highlighting the need for further research to address knowledge gaps.

Conclusions

This systematic review provides information on the landscape of SUD treatment outcomes in Africa. Although findings in some studies demonstrated promising outcomes in treatment completion and reductions in substance use, the variability in abstinence rates, high relapse rates, and substitution with other substances highlights the complexities of achieving and sustaining recovery from SUDs. The diversity in treatment modalities, ranging from outpatient and residential programs to community-based camps, reflects adaptability to resource constraints but also underscores the need for standardized, evidence-based approaches tailored to the unique socio-economic and cultural contexts in these settings.

Notably, the scarcity of research across African countries is a significant gap, with only studies included from five countries. This limitation calls for more extensive research across the continent to better understand the effectiveness of SUD treatments.

Abbreviations

AUDs	Alcohol Use Disorders
AUDIT	Alcohol Use Disorders Identification Test
ASSIST	Alcohol, Smoking, and Substance Involvement Screening Test
CBT	Cognitive Behavioural Therapy
DALYs	Disability-Adjusted Life Years
HICs	High-income countries
JBI	Joanna Briggs Institute critical appraisal tools for systematic reviews
MI	Motivational Interviewing
QoL	Quality of life
RP	Relapse prevention
SUDs	Substance Use Disorders

Supplementary Information

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Supplementary Material 1

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Author contributions

CB, NMT, DLS, and WV conceived and designed the systematic review protocol and contributed to developing the search strategies and inclusion criteria. CB, FDM, and DM conducted database searches and screened titles and abstracts for eligibility. CB and DM extracted data from the included studies and synthesized findings while CB drafted the initial manuscript. CB, NMT, DLS, FDM, GS, MM, DK, BBM, and WV critically reviewed and edited the manuscript for intellectual content. All the authors have read and approved the final manuscript for submission.

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Data availability
The datasets generated during the review are available from the corresponding author upon request. All the data included in this systematic review are drawn from publicly available publications and databases, which are cited within the manuscript.

Declarations

Ethics approval and consent to participate
This systematic review was conducted as part of a larger study that received ethical approval from the MakSPH Research and Ethics committee (SPHREC) in Uganda.

Human ethics and consent to participate
Not applicable. The systematic review did not involve any primary data collection from human participants.

Consent for publication
Not applicable. This manuscript does not contain any individualized data in any form that requires consent for publication.

Competing interests
The authors declare no competing interests.

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