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HIV programme to enhance adherence to art among older adolescents and younger adults living with HIV in Africa

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Abstract

Background The global concern of suboptimal viral load suppression (VLS) rates falling below the 95% target among older adolescents living with HIV (OALHIV) and young adults living with HIV (YALHIV) remains a critical concern, particularly in Namibia and other regions of Africa. These low suppression rates are influenced by multiple factors, including the unique developmental circumstances of this age group, limitations within healthcare systems, and broader socio-environmental determinants. The absence of targeted HIV programmes that address the specific needs of OALHIV and YALHIV highlights a significant gap in care. In response, this study aimed to develop an HIV programme specifically designed to enhance adherence and improve VLS outcomes among this population.

Methods The study employed an explanatory sequential mixed-methods approach, conducted in four distinct phases. Participants included OALHIV, YALHIV, HCPs, and HIV, all selected through purposive sampling. Findings from the initial phases were synthesised into key elements, which informed the development of an HIV programme guided by Dickoff's Practice-Oriented Theory and validated following the online Delphi technique. Data was collected through a semi-structured online questionnaire and analysed using IBM SPSS version 28. Consensus was achieved with 15 HIV experts.

Results The study identified various individual, health system, and community-level barriers negatively impacting OALHIV and YALHIV, reinforcing the necessity for a tailored HIV programme to enhance treatment adherence and VLS. The findings emphasised the importance of multi-sectoral collaboration, involving diverse stakeholders and multiple levels of government, in addressing the specific needs of this demographic. Additionally, the study revealed a 45.4% (75/165) consensus on the theories, tools, strategies, and guidelines required for the effective management of this age group.

Conclusion The development of an HIV programme tailored for OALHIV and YALHIV is a critical step toward optimising interventions to achieve VLS targets (95%) set for this age group. This process necessitates a collaborative effort that integrates appropriate theoretical frameworks, evidence-based strategies, standardised guidelines and tools. Nevertheless, its feasibility and impact require further evaluation.

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Keywords Adherence, Delphi technique, HIV programme, Older adolescents, Practice-oriented theory, Viral load suppression, Younger adults

1 Background

Managing the HIV epidemic among older adolescents (aged 15 to 19 years) and young adults (aged 20 to 24 years) remains a global challenge, particularly in Africa [10, 42]. HIV programmes targeting this population continue to face a persistent theory–practice gap, necessitating the development of an evidence-based intervention to address this issue. Adherence to antiretroviral therapy (ART) and the achievement of viral load suppression (VLS) are critical for improving health outcomes and reducing HIV transmission [14, 60].

In 2014, the Joint United Nations Programme on HIV and AIDS (UNAIDS) [32] launched the 90-90-90 global targets to accelerate progress toward ending the HIV/AIDS epidemic as a public health threat by 2020 [33]. These targets were later revised to the more ambitious 95-95-95 framework, to be achieved by 2025, reflecting a strengthened global commitment to HIV control [34, 35, 64].

Despite these global efforts, a 2019 analysis using modelling techniques based on UNAIDS-released data found that only 60 out of 170 countries successfully reported data on all three 90-90-90 targets [25]. Furthermore, a significant number of these countries were unlikely to meet the targets by 2020 [25, 45]. In sub-Saharan Africa (SSA), only three countries namely; Botswana, Eswatini, and Namibia successfully achieved the modelled targets [45]. However, despite Namibia's overall success, older adolescents living with HIV (OALHIV) and young adults living with HIV (YALHIV) remain disproportionately affected, with VLS rates of 60.7% and 65.7%, respectively, as of 2019 [46, 47].

Notably, six high-burden African countries conducted Population-Based HIV Impact Assessment (PHIA) surveys between 2015 and 2022. In these surveys, individuals aged 15 to 24 years exhibited the lowest VLS rates compared to adults. These rates ranged from 54.7% in Uganda to 77.1% in Eswatini [58]. Significant variations in VLS persist within this demographic, with OALHIV and YALHIV demonstrating a higher prevalence of inadequate VLS, estimated at 29% (37). This ongoing challenge undermines efforts by African countries to achieve the goal of ending AIDS by 2030 [34, 35] and highlights the need for the development of an HIV programme specifically tailored to improve adherence and VLS among this age group.

A targeted HIV programme designed to enhance adherence and improve VLS is essential to address the unique barriers faced by OALHIV and YALHIV [30, 36]. Although existing intervention strategies for people living with HIV (PLHIV) with high viral loads (HVL) are well-documented, they are not specifically tailored to meet the needs of OALHIV and YALHIV [58]. Moreover, the implementation of these strategies has faced significant challenges. Therefore, the proposed programme aims to establish a standardised approach to managing OALHIV and YALHIV with HVL. It will incorporate a conceptual framework that clearly delineates roles and responsibilities across all levels of management, including national, health facility, and community levels.

Consequently, it is essential to convene HIV experts to address the following research question: *What strategies should an HIV programme employ to enhance adherence among OALHIV and YALHIV to achieve VLS within these specific age cohorts?* This

initiative seeks to contribute to the existing body of evidence, providing a foundation for future policy and programmatic recommendations tailored to the African context.

2 Methods

2.1 Study aim, design, and setting

This study aimed to develop an HIV programme to strengthen HIV management and adherence to ART among OALHIV and YALHIV in Africa. A sequential explanatory mixed-methods (QUAN → qual) research design was employed [22], integrating both interpretivist and post-positivist philosophical frameworks [27, 28]. This approach facilitated comprehensive data collection and analysis from multiple sources within a single study [13]. The research was conducted in five high-burden districts of Namibia, involving healthcare providers (HCPs), OALHIV, YALHIV, HIV experts overseeing the management of PLHIV across the 14 regions. These five districts accounted for 66% (13,161) of the total study population of 21,935 OALHIV and YALHIV across Namibia's 34 districts.

This study was conducted in four phases, as illustrated in Fig. 1. In Phase One, a retrospective quantitative approach was applied across 90 selected health facilities to evaluate the level of VLS and identify existing interventions that support ART adherence among OALHIV and YALHIV. Phase Two utilised a qualitative phenomenological design to investigate the lived experiences of both OALHIV and YALHIV, along with healthcare HCPs managing this population group. These initial phases offered valuable insights into

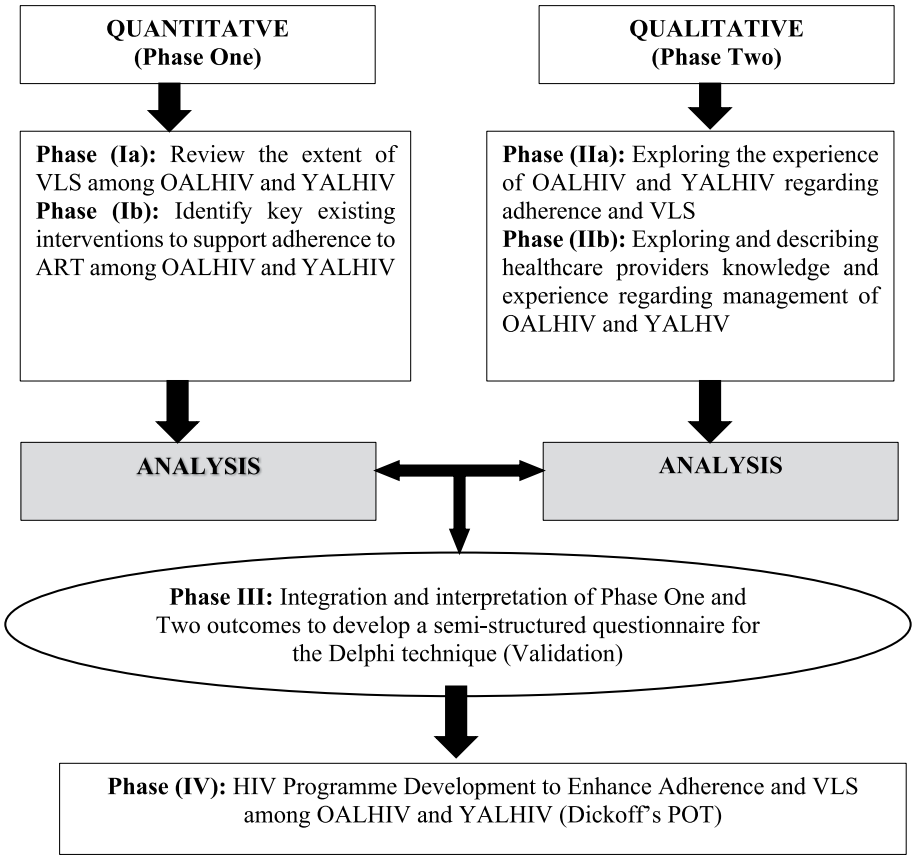

Fig. 1 Summary of study phases leading to the development of HIV programme to improve adherence and viral load suppression among OALHIV and YALHIV

the evidence-based strategies currently employed to enhance ART adherence. Phase Three combined and analysed the findings from Phases One and Two, which informed the development of an online semi-structured questionnaire for the eDelphi technique, aiding in the refinement and validation of the HIV programme. Finally, Phase Four concentrated on designing an HIV programme specifically aimed at improving ART adherence and VLS among OALHIV and YALHIV, guided by Dickoff's Practice-Oriented Theory (POT).

2.2 Study populations

This study engaged a diverse group of OLHIV. YALHIV and HIV experts are actively involved in the implementation of HIV programmes specifically targeting adolescents and young adults. Their input was essential for validating the findings and laying the groundwork for the development of a programme tailored to this age group. Expert opinion refers to the interpretations and insights provided by individuals with recognised expertise in a specific field [23, 44]. The study population included individuals to whom the findings could be generalised or transferred [7, 15]. These HIV experts comprised programme officers from the HIV Response Division, regional clinical mentors, and public health specialists from the Centers for Disease Control and Prevention.

2.3 Sampling and sample size

The researchers employed a purposive sampling technique, selecting experts based on their knowledge and experience in HIV management [18, 48]. The study included HIV experts with over five years of experience in clinical and programmatic management, while those with less experience or not currently involved in HIV work were excluded. The study utilised the IS-adapted stepwise approach from Delbecq et al. [20] to identify and validate program elements. This included creating a knowledge resource nomination worksheet, systematically reviewing and selecting qualified experts, and inviting them to participate in the Delphi expert panel [54].

Based on the eligibility criteria, 30 HIV experts were identified and invited to validate the HIV programme. Of these, 17 (56.6%) participated in the Delphi process, while two withdrew due to work commitments. Ultimately, consensus was achieved with 15 experts, who showed 100% agreement in the final round [8]. Namibia consists of 14 regions, with each expert representing one region, which includes both rural and urban areas, as well as the national office.

2.4 Data collection method and analysis

The Delphi technique was conducted in three rounds, as outlined in Table 1. Findings from Phases One and Two were shared online via Microsoft Teams, where the goal of developing an HIV programme to improve adherence and VLS was explained. HIV experts' questions were addressed before the first round, and informed consent was obtained via email. A Google Forms questionnaire, based on insights from OALHIV, YALHIV, HCPs, and stakeholder roles, was used for data collection across all rounds. A pre-test in July 2023 with a different group helped refine the questionnaire for clarity and relevance. [1].

Table 1 Delphi Technique steps and activities to reach the consensus

Timeline	Step of the eDelphi Technique	No of participants	Data collection tools and approaches	Data analysis approaches
August 2023	Preparatory Round 1	17	Presentation of results to the selected HIV experts via MS Teams, Online Google form questionnaire created from the findings of Phases One and Two	Colaizzi's seven steps and, thematic analysis
September 2023	Exploratory Round 2	15	A five-point Likert scale Google form questionnaire based on the results from Round 1	Descriptive statistics (frequency, mean and standard deviation) to measure variability among HIV experts using SPSS
October 2023	Consensus Round 3	15	An online binary (Yes/No) questionnaire was created based on the agreement levels from Round 3	Proportion or percentage

HIV Human Immunodeficiency Virus, *SPSS* Statistical Package for the Social Sciences, *VLS* viral load suppression

2.5 Measures to ensure trustworthiness during the Delphi technique process

Credibility was ensured through continuous iteration and feedback exchange with the experts, a process recognised as member checking [49]. To enhance dependability, the study incorporated a diverse group of policy implementers with substantial experience in the HIV/AIDS response in Namibia. Confirmability was ensured by clearly describing the data collection tools and how the data were analysed throughout the three rounds of the Delphi Technique. Transferability was established by having HIV policy implementers validate the expert consensus.

2.6 Ethical approval and consent to participate

Ethical approval for the study was obtained from the University of South Africa Research Ethics Committee, with reference number 12786918_CREC_CHS_2021 and the local Ministry of Health Research Ethics Committee (MHREC), with reference number 17/3/3/JK. Approval covered all stages of the study as outlined in the methodology, including data collection and publication. This study involved human subjects and was performed in accordance with the Declaration of Helsinki and the research guidelines and regulations of Namibia. Written informed consent was obtained from YALHIV and OALHIV, including two participants who were under 18, in accordance with Namibia's Child Care and Protection Act (2015:129 [50]), and was waived by MHREC. The Act permits individuals aged 14 and older, or those deemed sufficiently mature, to provide independent informed consent.

3 Results

3.1 Characteristics of study participants

A total of 15 HIV experts with diverse skills and educational backgrounds participated in the study, as summarised in Table 2. Their responses were systematically documented across all study rounds. A significant proportion of these experts are HIV clinical mentors, with 20% serving as regional HIV clinical mentors, 20% as senior clinical mentors, and 13.3% as Namibian Adolescents Treatment Supporter Programme officers. The remaining 4.67% comprised experts in other relevant categories.

Clinical mentors are healthcare professionals who play a pivotal role in expanding HIV care, treatment, and prevention within resource-constrained settings. They employ a

Table 2 Characteristics of HIV experts in Namibia
(Source: Researchers' own work)

#	Professional positions	Current positions	# of years managing PLHIV
	RN	National HIV Mental Health (Programme Officer)	5
	SW	Namibia Adolescent Treatment Support (Programme Officer)	6
	MO	Regional HIV Clinical Mentor	6
	RN-PHS	Namibia Adolescent Treatment Support Programme Officer	8
	RN	Senior Paediatric HIV Expert Nurse	8
	MO	Public health specialist CDC-Namibia	8
	RN-PHS	Nurse Mentor	9
	FP	Senior HIV Clinical Mentor	12
	PHS	Senior HIV Clinical Mentor	13
	FP	Regional HIV Clinical Mentor	14
	IDS	Regional HIV Clinical Mentor	15
	PHS	Regional HIV Clinical Mentor	15
	IDS	Senior HIV Clinical Mentor	18
	SW-PHS	HIV Testing Services Programme Lead (Programme Officer)	19
	PHS	Public health specialist, CDC-Namibia	20

FP family physician, *IDS* infectious disease specialist, *MO* medical officer, *PHS* public health specialist, *PLHIV* people living with HIV, *RN* Registered Nurse, *SW* social worker

problem-solving approach to enhance the delivery and effectiveness of HIV-related service [31]. In addition to the HIV experts, the findings were shared with a group of six policy implementers from the Ministry of Health. They were selected for their expertise and extensive experience in implementing HIV response programmes to assess the feasibility and potential for implementation.

3.2 Outcomes and consensus from the delphi technique

Consensus was achieved anonymously through unanimous agreement among all HIV experts in the third round of the Delphi technique. Table 3 below presents an example of data handling and analysis, illustrating a sample from each round up to round three. Consensus among the experts on the role of the National AIDS Response Team was reached for the roles that scored 100%, as shown in Table 3.

A total of 165 elements were generated by HIV experts, representing approaches at the national, facility, laboratory, and community levels, and encompassing guidelines, theories, tools, and strategies. The outcomes of Round Three were analysed, resulting in consensus on 75 elements (45.4%) deemed essential for the development of an HIV program aimed at improving VLS among OALHIV and YALHIV. However, 90 elements (54.6%) did not achieve 100% agreement among the experts in Round Three, as presented in Table 4.

3.3 Development of the HIV programme guided by Dickoff's practice-oriented theory (Phase IV)

A targeted programme was developed to improve adherence and VLS among OALHIV and YALHIV, based on a consensus reached by HIV experts. This consensus incorporated 75 key elements and reflected an overall agreement rate of 45.4%, guiding the design and implementation of the intervention. This programme was structured using the Practice-Oriented Theory (POT) to establish a robust conceptual framework, as

Table 3 Summary of Rounds One to Three Consensus on the Role of the National AIDS Response Team
(Source: Researchers' own work)

Elements of the Role of the National AIDS Response Team generated in round one	Round One: themes	Round two: five-point Likert scale		Round three consensus	
	Frequency	Mean	Standard Deviation	Yes (%)	No (%)
1. Capacitate healthcare providers to manage youth with HVL	6	1.19	0.402	100	0
2. Combat stigma and discrimination	2	1.238	0.436	100	0
3. Develop a strategy to manage youth with HVL	17	1.286	0.644	100	0
4. Engage Stakeholders in the management of youth with HVL	6	1.095	0.301	100	0
5. Ensure Mental health integration in HIV service delivery	1	1.143	0.359	100	0
6. Ensure treatment optimisation for youth living with HIV	4	1.19	0.402	100	0
7. Extend the Namibian Adolescents' Treatment Support to other sites	1	1.143	0.359	100	0
8. Improve the supply of ART commodities	3	1.286	0.463	100	0
9. Provide psychosocial support to youth with HVL	3	1.333	0.73	100	0
10. Track site performance through data management	6	1.381	0.498	100	0
11. Advocate for social Grants for youth	1	2	0.894	70	30
12. Avail IEC materials to increase awareness	4	1.619	0.865	85	15
13. Economic empowerment of youth with HVL to promote adherence	1	1.857	0.91	85	15
14. Support online applications for youth communication and feedback	2	1.952	0.865	85	15
15. Advocate for funds to manage youth with HVL	4	1.524	1.123	90	10
16. Coordinate the management of youth with HVL	4	1.476	0.928	90	10
17. Design Quality Improvement Collaboratives	2	1.571	0.676	90	10
18. Advocate for youth-friendly service	4	1.238	0.436	95	5
19. Engage the community in the management of youth	3	1.619	1.071	95	5
20. Support research on managing youth with HVL	2	1.429	0.746	95	5
21. Support youth engagement as ambassadors	1	1.476	0.512	95	5

HIV Human Immuno-deficiency Virus, *ART* Antiretroviral Therapy, *IEC* Information Education Communication, *AIDS* Acquired Immune Deficiency Virus, *HVL* High Viral Load

Table 4 Summary of outcomes and consensus.
(Source: Researchers' own work)

POT components	Approaches	The number of Consensus reached	Total number of themes	% of Consensus reached
Agency	National	10	21	47.6
	Facility	16	34	47
	NIP (Laboratory)	9	12	75
	Community	3	16	18.7
Procedure or guiding principles	Guidelines	8	17	47
	Theories	3	11	27.2
	Tools	8	20	40
	Strategies	18	34	52.9
Total		**75**	**165**	
		45.4% (75/165)		

*POT, Practice Oriented Theory; NIP, Namibia Institute of Pathology

illustrated in Fig. 2. The POT provides a comprehensive foundation by describing six interrelated aspects of activity that informed the programme's development: agency, recipiency, context, dynamics, procedures, and terminus [51, 67]. Following meta-inference and validation, the finalised HIV programme is presented as follows:

3.4 The expected agents to implement the HIV programme at various levels

According to [21], an agent refers to the programme implementers responsible for specific activities within the framework. Through the POT, the researchers identified key agencies responsible for reinforcing adherence among OALHIV and YALHIV to improve VLS. These agencies include the National AIDS Response (NAR), the National Institute of Pathology (NIP), health facilities, and communities.

Following the refinement and validation process conducted by the policy implementers, the following strategies were recommended for each agency:

> *The NAR should take responsibility for developing the strategy, monitoring its performance, providing psychological support, integrating mental health services, improving the ART supply chain, combating stigma and discrimination, optimising treatment access, capacitating healthcare providers, engaging stakeholders, and*

Fig. 2 Conceptual framework to guide implementation for HIV programme to improve adherence and viral load suppression based adapted from Dickoff POT [21].

extending the paediatric peer support programme to all OALHIV and YALHIV regardless of their VLS.

The NIP should play a crucial role and in ensuring the quality of laboratory results by appropriately handling sampling, improving turnaround time for viral load test and HIV drug resistance results, and notifying high viral load results. It also ensures the use of reliable suppliers for consumables and establishes a tracking system for easy access to results. Additionally, the NIP provides accurate results to healthcare providers for making informed decisions in patient care.

The health facilities with support from the NAR should implement various strategies to strengthen viral load monitoring, psychosocial support and enhanced adherence counselling. The facilities utilise a tracking system for earlier identification of high viral load cases, optimising ART treatment, conducting peer support and mental health screening, facilitating HIV disclosure and youth-friendly services, and operating effectively within multidisciplinary teams. Additionally, the facilities should conduct a root cause analysis on issues affecting the VLS and provide proper referrals, engaging stakeholders, and enhancing retention in care with caregiver involvement.

The community should also play a significant role in reducing stigma and discrimination, assisting OALHIV and YALHIV in achieving VLS, establishing support systems, and acting as a crucial network for those with high viral load. The key roles will involve the provision of peer support, education and awareness as well, adherence support, and facilitating access to services, among other important functions.

3.5 Recipients or beneficiaries of the HIV programme

According to Dickoff et al. [21], recipients are individuals who are either primary or secondary beneficiaries of a programme. The HIV programme primarily targets OALHIV aged 15–19 years and YALHIV aged 20–24 years as the direct beneficiaries. Additionally, caregivers and family members of OALHIV and YALHIV serve as secondary beneficiaries, as they provide essential support to these individuals.

Both primary and secondary beneficiaries play dual roles as agents and recipients at the facility level. They actively participate in the planning and implementation of the programme as health consumers and collaborate with healthcare facilities to promote patient-centred care.

3.6 The context in which HIV programmes can be implemented.

Dickoff et al. [21] define context as the environment or framework in which an activity takes place. The HIV programme is designed for implementation across all levels of the healthcare system. This includes community post sites, primary healthcare facilities, district hospitals, intermediate hospitals, and referral hospitals.

HIV experts reached a consensus that the programme would be most effective and efficient if implemented primarily at primary health clinics and community health centres. These facilities serve as the initial points of care within the community. Patients requiring specialised ART services can be referred to higher-level facilities, ensuring standardised management of all PLHIV in accordance with the ART guidelines. While minor variations in service quality may exist across different levels of care, these differences are largely influenced by the availability and expertise of key healthcare personnel.

3.7 The dynamics in which adherence and VLS among OALHIV and YALHIV can be improved

Dickoff et al. [21] describe dynamics as the source of energy that drives an activity. In the context of this study, dynamics encompass the forces, mechanisms and processes that influence treatment adherence and VLS among OALHIV and YALHIV.

Successful implementation of the HIV programme is dependent on motivation among both programme agents (such as HCPs and policymakers) and programme recipients (OALHIV and YALHIV). However, both health care providers and OALHIV/YALHIV have identified interpersonal and personal relationship factors, as well as environmental, contextual and health system dynamics that affect ART adherence and VL management. These influential factors, which require targeted intervention, are detailed in Table 5.

Table 5 Dynamics influencing adherence to ART among OALHIV and YALHIV (Source: Researchers' own work, Phase 2 results of the study)

Dynamics influencing ART adherence and VLS	OALHIV and YALHIV	Health care providers
Interpersonal relationship dynamics	• Poor interpersonal relationships with healthcare providers due to their attitude, being judgmental and not being trusted • Poor interpersonal relationships with caregivers, partners and parents to disclose their HIV status	• Poor relationship with OALHIV and YALHIV • Lack of teamwork and Ubuntu among healthcare workers
Personal dynamics	• Self-stigma, forgetfulness, lack of disclosure • Not living without biological parents and /or orphans • Lack of information and knowledge about HIV, adherence and VLS • Mental health issues and poor coping skills	• Lack of knowledge on VL management • Poor counselling skills to enhance adherence • Poor compliance with guidelines and protocol
Environmental dynamics	• Schools are not a conducive place to take ART • Community stigma and discrimination • Lack of an adolescent-friendly clinic • Lack of technological mobile health tools • Staying far from the health facility	• Overdependent to implementing partners • Poor community and family involvement • Poor supportive supervision
Contextual dynamics	• Cultural practices hindering disclosure • Socioeconomic challenges hindering access to basic needs such as food, transport, housing and education	• Lack of intrinsic and extrinsic motivation from the employer • Inadequate contact tracing and home visits
Healthcare System Dynamics	• Refusing referral of a multi-disciplinary service in adherence sessions to guarantee confidentiality • Lack of options to be treated by a preferred healthcare provider • Fragmented services • Negative attitude of health care providers • Doubting the efficacy of health care providers treating them due to their attitude • Poor facility process and patient flow contribute to long waiting hours • Lack of psychosocial support services • Inconvenience clinic hours and long waiting times	• Poor interprofessional relationship • Enhancing the viremia clinic day • DAART, teen clubs, adolescent peer treatment support

ART antiretroviral therapy, *DAART* direct administer ART, *OALHIV* older adolescent living with HIV, *YALHIV* younger adult living with HIV

Table 6 Interventions/strategies suggested by OALHIV and YALHIV to improve adherence from ART (Source: Researchers' own work)

Differentiated Service Delivery Approach	1. Viremia clinic day 2. Direct ART Observed Therapy 3. ART treatment optimisation
Psychosocial support	1. Teen Club 2. Namibian Adolescent Treatment Supporters
Community involvement	1. Guardians or Caregiver Involvement 2. School Involvement 3. CBOs involvement
Multi-disciplinary team	1. Multi-disciplinary team
Enhanced adherence counselling	2. Enhanced adherence counselling
Implementing Partner Support	1. Contact tracing and home visits 2. Incentive to support adherence

Table 7 Healthcare providers' recommendations to enhance adherence and VLS among OALHIV and YALHIV.
(Source: Researchers' own work)

Healthcare Suggestions to improve HIV care and management	Recommendation to the National HIV/AIDS Programme	Avail more IEC materials Capacity building for healthcare workers Improve the Supply Chain of medication Coordination of all activities at each level Incentive for YLHIV
	Recommendation to health facilities	Facility youth-friendly services Coordination of all activities at the facility level Capacity building of guardians Capacity building of life-skilled teachers Peer and psychosocial support Multidisciplinary approach Differentiated Service Delivery Models
	Recommendation to the National Institute of Pathology	NIP to avail the results on time NIP to fast-track all HVL NIP to improve access to the results
	Recommendation to communities	Support adherence to ART treatment Fight discrimination in the community Educate the community on HIV

ART antiretroviral therapy, *ICE* Information, Education and Communication, *HVL* high viral load, *NIP* Namibia Institute of Pathology, *YLHIV* youth living with HIV

3.8 The guiding procedures or principles that influence the implementation of the HIV programme

Dickoff et al. [21] define guiding principles as protocols or procedures that direct an activity. In this study, HIV experts reached a consensus on the theoretical foundations, tools, and strategies needed to promote optimal adherence to ART, based on input from OALHIV, YALHIV, and HCPs. These agreed-upon principles, summarised in Tables 6 and 7, emphasise the utilisation of existing policies and guidelines to ensure the effective implementation of the HIV programme.

In the context of the programme, HIV experts recommended that the guiding principles incorporate various theories and models. One of these is the COM-B Model for Behaviour Change, which considers the interplay between capability, opportunity, and motivation in influencing adherence. Additionally, the Health Belief Model was highlighted for its focus on individuals' perceptions of health risks and the benefits of treatment adherence. Self-management behaviour theories were also emphasized, as they

promote individual responsibility and empowerment in managing long-term conditions such as HIV.

Furthermore, a consensus was reached on the necessity of reassessing existing guiding frameworks, such as the National Strategic Framework for HIV/AIDS, the national ART Guidelines, and the Standard Curriculum for Teen Clubs. These frameworks are particularly relevant for managing adolescents living with HIV and integrating sexual and reproductive health into HIV care. Experts also underscored the importance of incorporating digital health innovations, including digital reminders for medication adherence and HIV viral load tracking registers. In addition, the development of Information, Education and Communication (IEC) materials and the promotion of interprofessional collaboration among multidisciplinary teams were recognised as essential for delivering integrated and comprehensive care.

Key recommendations included optimising and reviewing the Enhanced Adherence Counselling guidelines and integrating standard operating procedures (SOPs) for mental health and HIV care. Additionally, the development of tailored guidelines for managing OALHIV and YALHIV was emphasized.

ART, antiretroviral therapy; CBOs, community-based organisations.

Consensus was reached on several recommendations proposed by HCPs to enhance adherence to ART among OALHIV and YALHIV, with the ultimate goal of improving VLS. These recommendations, which have been validated through expert consensus, are summarised in Table 7.

3.9 The outcome of the implementation of the HIV programme to improve adherence and VLS (terminus)

According to Dickoff et al. [21], the terminus or endpoint of an activity refers to the desired outcomes of the specific activities within the framework. HIV experts unanimously agreed on the overarching objective of the HIV programme, which is to enhance adherence to ART and achieve sustainable VLS among OALHIV and YALHIV.

The primary goal of the programme is to achieve sustainable VLS, which plays a critical role in restoring immune system function and reducing the incidence of opportunistic infections. Additionally, the programme aims to significantly decrease HIV transmission, ultimately supporting the global initiative of "Undetectable = Untransmittable" (U = U).

3.10 Conceptual framework to guide the implementation of the HIV programme to improve adherence and VLS.

Following the completion of the Delphi Technique, consensus was reached among 15 HIV experts. They agreed on the key components essential for the successful implementation of the HIV programme. Researchers adopted the six aspects of activity outlined in the POT as the guiding framework. These aspects include agency, recipiency, contexts, dynamics, procedure, and terminus. They were used to structure the programme and ensure a comprehensive approach to improving ART adherence and viral VLS. The conceptual framework is illustrated in Fig. 2.

This framework is designed to encompass all OALHIV and YALHIV as recipients, ensuring that they receive regular care and treatment at public health facilities, regardless of their VLS status. The development of the HIV programme and its conceptual

framework is driven by the global commitment set forth by UNAIDS, aiming to end AIDS as a public health threat by 2030.

4 Discussion

This study aimed to develop and outline an HIV programme to support African countries burdened by high numbers of OALHIV and YALHIV in improving adherence to ART and achieving VLS. The programme was developed following the six elements of the POT, which are discussed below, with support from existing literature.

4.1 Role of the Agencies responsible for implementing the HIV programme

The agencies responsible for implementing the programme were categorised into the national AIDS response, national laboratories, health facilities teams, and communities. The United Nations Children's Fund (UNICEF) advocates for governments to identify evidence gaps, establish priorities, and develop targeted strategies. These efforts aim to enhance VLS and treatment outcomes, particularly in age-specific groups (UNICEF, 2021). The role of national laboratories is critical in ensuring the consistent provision of essential laboratory materials, proper sample handling, and efficient transportation to facilitate quality and timely viral load results [4]. This aligns with WHO recommendations, which emphasise the need for routine data quality assurance measures to assess and improve the accuracy of viral load results at healthcare facilities [68, 69].

Despite their significance in global HIV response initiatives, OALHIV and YALHIV often demonstrate lower engagement in healthcare and lower levels of VLS compared to adults [6]. This highlights the importance of strengthening healthcare promotion across all levels of healthcare facilities [38]. Furthermore, HCPs should adopt a supportive and non-judgmental approach when managing these age groups. This approach should address not only physical health but also prioritise mental well-being [41].

Tailored interventions are essential to address HIV-related stigma and discrimination affecting OALHIV and YALHIV [34]. These populations face unique challenges related to stigma and discrimination [40]. The WHO recommends implementing national initiatives supported by civil society organisations (CSOs) and networks for PLHIV. These efforts aim to educate communities on ART and VLS, ultimately helping to reduce stigma [60].

HIV experts in this study emphasised the role of communities in combating stigma and discrimination to foster improved adherence to ART among OALHIV and YALHIV. In 2020, UNAIDS provided specific directives for countries to eradicate HIV-related stigma across healthcare, community, workplace, education, justice, and emergency contexts [38]. Stigma and discrimination are recognised as major psychosocial stressors, significantly impacting the mental health and overall well-being of young individuals living with HIV [24, 34].

4.2 The role of recipients in implementing the HIV programme

Optimal adherence to ART is fundamental to achieving VLS, preventing drug resistance, and ensuring positive health outcomes for PLHIV [60]. For these individuals, taking an active role in their ART regimen is crucial. This includes not only consistent adherence to prescribed medications but also active engagement and collaboration with HCPs.

The support of caregivers and family members plays a pivotal role in ensuring adherence to ART among OALHIV and YALHIV, as their involvement significantly influences treatment outcomes [29, 37]. A strong support network comprising family members and caregivers increases the likelihood of sustained adherence. These individuals offer various forms of support, including emotional, practical, financial, logistical, and psychological assistance. Such support is essential in helping OALHIV and YALHIV navigate the challenges of living with HIV [70].

A collaborative approach involving HCPs, OALHIV and YALHIV, and caregivers fosters a holistic support system that promotes a better quality of life and improved health outcomes.

4.3 The context in which the programme will be implemented

In this setting, the health facility serves as the primary environment where healthcare services are delivered to recipients. Consequently, the HIV programme will be implemented across all levels of the healthcare system, in alignment with the policies of the Ministry of Health [63]. These levels may include community health posts, primary healthcare clinics, district hospitals, intermediate hospitals, and referral hospitals. The specific structure depends on the organisational setup of the healthcare system in each country [17]. Although the clinical management of HIV is guided by national ART guidelines, treatment outcomes can vary across different levels of facilities due to a range of influencing factors [12].

4.4 Dynamics in which the programme will be implemented

The dynamics influencing the implementation of the HIV program encompass social, economic, psychosocial, psychological, and organisational factors that either motivate or facilitate adherence to ART and VLS [39]. In this context, multiple interconnected elements contribute to supporting OALHIV and YALHIV in maintaining adherence.

A strong support network plays a crucial role in improving adherence, which includes a trusting patient-provider relationship [61], peer support, and family involvement. A non-judgmental, open interaction between HCPs and OALHIV and YALHIV fosters trust and engagement, encouraging honest discussions about challenges to adherence [37]. Establishing peer support networks among individuals living with HIV provides mutual encouragement, shared experiences, and coping mechanisms, thereby reducing isolation and stigma. Additionally, family involvement in the care process offers emotional and practical support, creating a nurturing home environment that reinforces consistent adherence [37, 70]. Collectively, these dynamics contribute to enhanced ART adherence, improved treatment retention, and better overall health outcomes among OALHIV and YALHIV.

Self-efficacy, motivation, and coping skills are essential personal dynamics that influence adherence to ART among OALHIV and YALHIV. Empowering individuals to take proactive control of their health through education, goal-setting, and positive reinforcement helps to build confidence in managing ART regimens (37). Identifying and leveraging intrinsic motivation, such as personal health goals, academic aspirations, or social commitments, strengthens adherence and reinforces commitment to maintaining VLS (Choudry & Ganti, 2024). Additionally, enhancing coping skills enables OALHIV and YALHIV to effectively manage stress, anxiety, and other emotional challenges that may

arise during treatment, thereby reducing the risk of non-adherence [10]. These dynamics collectively foster a sense of autonomy, motivation, and resilience, leading to improved ART adherence and overall health outcomes.

Environmental dynamics, including accessibility to healthcare services, discrimination and stigma reduction, and technological innovations, also play a significant role in adherence to HIV treatment [2, 37]. Unhindered access to healthcare services, facilitated by convenient clinic hours and strategically located facilities, reduces logistical barriers to regular treatment visits [65]. Addressing stigma through education and policy reforms fosters a more supportive and inclusive healthcare environment. This encourages OALHIV and YALHIV to seek medical care without fear of discrimination or social exclusion [53]. Furthermore, the integration of technological advancements, such as mobile health (mHealth) tools, supports adherence by providing treatment reminders, tracking progress, and enabling real-time health management [16].

Cultural sensitivity, socioeconomic support, and mental well-being are key contextual dynamics that significantly influence adherence to ART among OALHIV and YALHIV [37, 62]. Ensuring cultural sensitivity in HIV interventions is essential, as it allows healthcare strategies to be tailored to the unique beliefs, values, and practices of diverse populations. This approach makes care more accessible, relevant, and effective [9].

Socioeconomic support plays a critical role in sustaining adherence by addressing basic needs such as food, housing, and education [66], which helps alleviate financial stressors that may otherwise hinder adherence to ART regimens [70]. Additionally, integrating mental health services and establishing proper referral systems is vital for addressing psychological challenges such as depression, anxiety, and emotional distress. These issues can negatively impact ART adherence [10].

4.5 Procedures to be followed when implementing the program.

The guiding principles of the HIV programme have been consolidated into guidelines, theories, strategies, and tools. In the field of HIV care, various theories and models are utilised to understand and address different aspects of ART adherence and behavioural change [11]. Given the unique needs and challenges faced by OALHIV and YALHIV, a tailored approach that integrates multiple theories, models, tools, guidelines, and strategies is considered the most effective [55, 59]. HIV experts involved in the program have collectively endorsed three theories or models, six guidelines, six key tools, and six key strategies (37).

The COM-B Model, Health Belief Model, and self-management behaviour frameworks provide critical insights into understanding and improving adherence to ART [5]. The COM-B, Model emphasises capability, opportunity, and motivation as three core components that determine behavioural outcomes, such as consistent ART adherence [52]. The Health Belief Model suggests that an individual's medication-taking behaviour is often influenced by past adverse drug reactions. These experiences can lead to negative associations with future medications, including ART, ultimately shaping their adherence and treatment perceptions [3]. In contrast, HIV self-management strategies help YLHIV and their caregivers in understanding and managing the condition, thereby improving health behaviours and treatment outcomes [19, 43].

These theories highlight the need to address both individual and external factors to ensure sustainable treatment adherence. Managing OALHIV and YALHIV requires

navigating complex challenges, including treatment adherence, disclosure, stigma, transitioning to adult care, sexual and reproductive health, psychosocial support, risk behaviours, and education. These challenges are addressed through guidelines, tools, and strategies [57]. A comprehensive strategy is essential, requiring capacity building for HCPs to equip them with the skills necessary to manage these groups and meet their distinct healthcare needs [56].

4.6 Terminus or outcomes expected of the HIV programme.

The HIV programme aims to support OALHIV and YALHIV in achieving durable VLS, reducing HIV transmission, improving health outcomes, and contributing to the goal of ending AIDS by 2030. Durable VLS enhances immune function and overall quality of life and reduces the risk of both AIDS-defining and non-AIDS–defining illnesses, aligning with the UNAIDS Fast-Track target [26].

In 2014, UNAIDS established the global goal of ending AIDS by 2030, which requires countries to achieve the interim "95-95-95" targets [33]. In alignment with this objective, Namibia has adopted the "97-97-97" targets by 2028, as outlined in the National Strategic Framework 23/24–27/28.

5 Conclusions

The management of OALHIV and YALHIV remains complex due to the unique challenges faced by this age group, including individual, health system, and community-related factors. Effective management requires HCPs to collaborate closely with a multilevel team, ensuring a comprehensive and integrated approach to care.

Recognising the individual uniqueness of each person requires a collaborative partnership involving various stakeholders. It also involves using multiple theories, strategies, and tools to enhance adherence and achieve sustained VLS. Therefore, the development of this tailored HIV programme is a critical step toward enhancing intervention strategies; however, its feasibility and impact require further testing.

5.1 Practical implications of the study

The findings of this study suggest that the established HIV programme can support HCPs and communities. It has the potential to aid in the comprehensive management of OALHIV and YALHIV. The pilot of this programme is currently underway, and the results will inform policymakers of the integration of the programme into the national ART guidelines.

5.2 Strengths and limitations of the study

This programme is among the first documented efforts in Namibia and potentially for the Southern African Development Community (SADC) settings. However, its feasibility, effectiveness impact require further testing through the implementation of a pilot study, which is currently underway and an evaluation to improve adherence and VLS as per the UNAIDS target.

This study was conducted specifically in Namibia, and its findings may not be applicable to other African regions due to differing cultural and systemic challenges that were not addressed. However, it provides a valuable foundation for similar initiatives in Southern Africa. Furthermore, the use of a limited number of participants (15) and

expert opinion-based methods, such as the Delphi technique, may introduce biases from subjective judgments and the selection of experts. These factors could influence the generalizability of the findings and should be taken into account when interpreting the results and planning future research in broader contexts.

Abbreviations

AIDS	Acquired immunodeficiency syndrome
ART	Antiretroviral therapy
CBO	Community Based Organisation
DAART	Direct Administration of ART
DPP	Directorate of Policy and Planning
DSP	Directorate of Special Programmes
EAC	Enhanced Adherence Counselling
HIV	Human immunodeficiency virus
HVL	High viral load
IEC	Information, education, and communication;
NAR	National AIDS response
NIP	National Institute of Pathology
OALHIV	Older adolescents living with HIV
PHIA	Population-based impact assessment
PLHIV	People Living with HIV
POT	Practice-oriented theory
SPSS	Statistical Package for the Social Sciences
SSA	Sub-saharan Africa
UNAIDS	Joint United Nations Programme on HIV/AIDS
VLS	Viral load suppression
YALHIV	Younger adults living with HIV

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Author contributions
JWN conceptualised the study, collected and analysed data and SH contributed to the verification of data analysis and writing of the manuscript.

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Data availability
All data generated or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Consent for publication
Not applicable.

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