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Effects of a Facility-Based Intervention on Knowledge, Attitude and Practice Regarding HIV Treatment Outcomes among Adolescents-and-Young-Adults on ART in Nigeria

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Abstract

Adolescents and young adults living with HIV (AYALHIV) face significant challenges in achieving optimal HIV treatment outcomes, including viral load suppression. This study aimed to evaluate the effectiveness of the Operation Triple Zero (OTZ) intervention in improving knowledge, attitude and practice (KAP) regarding antiretroviral therapy (ART) adherence and viral suppression among AYALHIV in Nigeria. A longitudinal clinical-ecological research design was employed with 228 AYALHIV on ART enrolled into the OTZ intervention across five health facilities in Niger state, north-central Nigeria from June to November 2023. Data was collected at baseline before the commencement of the intervention and at six months into the intervention (end line) using an interviewer-administered semi-structured questionnaire. Informed consent and/or assent were obtained from study participants and/or their caregivers, and ethical approval was obtained before commencement of the study. The majority of participants (51%) were female, 62% were older adolescents aged 15-19 years, 78.9% had had secondary education, and 98% were single. The study found improvements in KAP regarding ART adherence and viral suppression among participants after the OTZ intervention. However, no significant differences were observed in KAP scores between baseline and end-line assessments ($p \leq 0.05$). The OTZ intervention demonstrated potential in improving KAP regarding ART adherence and viral suppression among AYALHIV in Nigeria. Further research is needed to explore the long-term effects of the intervention and to identify strategies to enhance the KAP scores.

Keywords: *Adolescents and Young Adults, ART Adherence, Attitude, Knowledge and Practice, Viral Suppression.*

Introduction

In many low-income countries, HIV prevalence is escalating, with adolescents and young people (AYAs) comprising a significant proportion of those affected [1]. By 2022, 1.65 million adolescents aged 10-19 were living with HIV worldwide [2], with a staggering 85% residing in sub-Saharan Africa [2, 3]. Tragically, up to 150 young people die daily from HIV-related illnesses worldwide, with the majority of these deaths occurring in sub-Saharan Africa [4]. Challenges faced by adolescents and young adults living with HIV (AYALHIV) include inadequate treatment adherence and retention in care, which in turn lead to poor viral suppression, thereby threatening efforts to control the epidemic by 2030[5].

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In response, various African initiatives have been launched to empower AYALHIV to take charge of their health through accessible support services [6-8]. One such initiative is the Operation Triple Zero (OTZ) model, which fosters engagement, awareness, and well-being among AYALHIV through a comprehensive service delivery system [9, 10]. The OTZ intervention aims to increase knowledge, improve attitudes and enhance skills and practices (KAP) related to antiretroviral therapy (ART) adherence and viral suppression [11]. Understanding knowledge, attitude and practice (KAP) is crucial in addressing the unique needs of young people, who are increasingly driving the HIV epidemic [12]. The KAP model has been instrumental in promoting HIV prevention and treatment by raising awareness, driving behaviour change, and ultimately improving health outcomes.

Research on KAP related to HIV treatment outcomes has primarily focused on ART adherence, with a notable gap in studies examining KAP regarding viral load and suppression. Although existing research provides insights into KAP related to ART adherence among people living with HIV, data specifically focusing on adolescents and young adults remain scarce [13]. A Kenyan study on adolescents receiving second-line ART found that participants possessed adequate basic health knowledge, but struggled to translate this knowledge into practice and achieve favourable treatment outcomes [14]. Furthermore, there is a lack of data on the effectiveness of evidence-based interventions in improving KAP related to ART adherence and viral suppression. A comparative study in India evaluated the effectiveness of a peer-led intervention on KAP related to sexual, reproductive, and mental health issues among adolescents. The study found that participants in the peer-led approach demonstrated better knowledge of HIV awareness and exhibited positive help-seeking behaviours [15]. This highlights the need for further research on the impact of existing interventions on KAP related to HIV treatment outcomes. This study aims to investigate the effectiveness of the Operation Triple Zero intervention in improving KAP related to ART adherence and viral suppression among adolescents and young adults receiving ART in Niger State, Nigeria. The findings will inform the development of targeted intervention strategies to support the care of adolescents and young adults living with HIV.

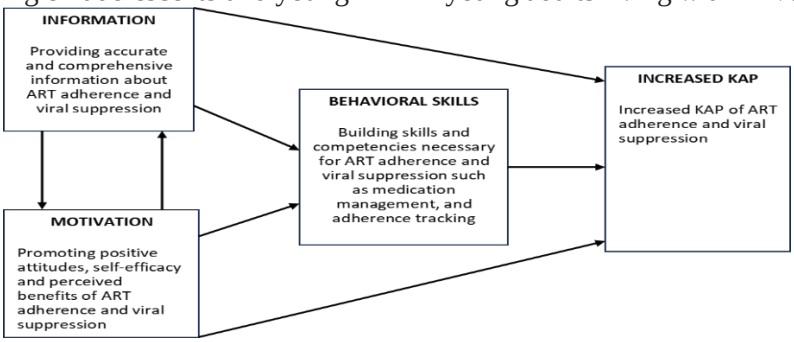

Figure 1. IMB Skills Model (Adopted from Fisher and Fisher 1992)

As shown in Figure 1, the K-A-P model is based on the Information-Motivation-Behavioural (IMB) skills model [16]. The model is based on the notion that providing accurate and comprehensive information about ART adherence and viral suppression (information), promoting positive attitudes, self-efficacy and perceived benefits of ART adherence and viral suppression (motivation) and building skills and competencies necessary for ART adherence and viral suppression such as medication management and adherence tracking (behavioral) skills are primary determinants of behavior change (Figure 1). It is therefore hypothesised that the OTZ intervention may cause an increase in the KAP

of ART adherence and viral suppression among study participants.

Materials and Methods

Description of Study Site

This study was conducted across 5 PEPFAR supported, high volume, public HIV treatment facilities purposefully selected across 5 local government areas (LGAs) in Niger state, northcentral Nigeria. The health facilities included General Hospital Minna (GH Minna), Ibrahim Badamasi Babangida Specialist Hospital Minna (IBBSH Minna), General Hospital Lapai (GH Lapai), General Hospital Suleja (GH Suleja) and Umaru Shehu Yar'Adua Memorial Specialist Hospital Sabon Wuse (USYMSH Sabon Wuse), all across Chanchaga, Paikoro, Lapai, Suleja and Tafa LGAs, respectively.

Study Population

Study population for this study included HIV-positive adolescents and young adults aged 10–24 years, enrolled into the OTZ intervention to whom their HIV status have been disclosed to them, who are already on ART in any of the facility of study, with at least 1 viral load report in the last 6 months before the study, able to provide written informed consent and/or assent and their caregivers can provide informed consent (participants aged 18 to 24 years do not need caregivers consent).

Study Design

This study adopted the clinical ecologic research design in a longitudinal study approach. The clinical ecological design supports studies in which the unit of observation is the same group.

Sampling Technique

The stratified random sampling method was used to ensure proportionate representation across all study sites.

Sampling Size

Sample size estimation was conducted for one proportion of the population with a viral load suppression rate of 82.0 [17]. Using Cochran's formula for sample size estimation, a total sample size of 227 participants was calculated. Adjusting for a 5% nonresponse, a total of 238 was estimated for the study.

Data Collection

A semi-structured interviewer-administered questionnaire with both open and closed-ended questions was developed from previous works [12-14]. The instrument was administered from 1st June to 30th June, 2023 for the baseline data collection and from 1st November to 30th November, 2023 for the end line collection across all the study site The semi-structured questionnaire instrument consisted of seven sections (sections A to I) which are: (A) socio-demographic data of respondents; (B) data regarding respondents knowledge of ART and ART adherence; (C) data regarding respondents' knowledge of viral load and viral load suppression; (D) respondent's attitude regarding ART and ART adherence; (E) respondent's attitude regarding viral load and viral load suppression; (F) respondent's practice of ART and ART adherence. A scoring system similar to that used by other authors was developed to determine respondents' level of knowledge [18, 19]. Ten (10) questions each on knowledge of ART and ART adherence; viral load and viral load suppression are scored with each right answer attracting one point. Those who score 0 to 2 points are classified as having poor knowledge; those who score between 3 to 6 points are classified as having fair knowledge, while those who score 7 to 10 points are classified as having good knowledge. Respondents' attitude is assessed using a 5-point Likert scale, each for 10 questions regarding attitude to ART and ART adherence, and Viral load and Viral load suppression. The overall attitude scores are graded as positive for aggregate 50% and above and negative attitude

for less than 50% [18]. Dichotomous statements (with Yes/No responses) are used to assess the practice of ART and ART adherence, likewise, the practice of Viral Load and Viral Load suppression. Answers indicating positive practice are considered as expected correct answers, and one point was assigned to each correct answer. A maximum score of five points can be obtained. Negative practices were defined by a score of 0 to 2. Positive practices were defined by a score of 3 to 5.

Data Processing and Analysis

Data was analysed using Statistical Package for Social Science Software (SPSS version 27).

Ethical Consideration

Ethical clearance was obtained from the Niger State Ministry of Health Ethics Committee and the Research, Ethics and Publication Committee of General Hospital Minna. Written Informed consent and assent were sought from each caregiver and adolescent, respectively (for adolescents 10-17 years), while written informed consent only was sought from participants 18-24 years before the conduct of the study.

Results

Socio-Demographic Information

This section presents socio-demographic characteristics of the study participants. The socio-demographic factors included were gender, age, marital status, educational level, employment status, religion, ethnic group and household living conditions (Table 1).

Table1. Responses to Questions on Socio-demographic Data

Item	Variables	Percentage (%)
Gender	Male	49
	Female	51
Age	10-14 years	23
	15-19 years	62
	20-24	15
Marital Status	Single	98
	Married	1
	Co-habiting	1
Educational Level	None	3.9
	Primary	9.2
	Secondary	78.9
	Undergraduate	5.3
	Postgraduate	2.6
Employment Status	Student	89
	Self-employed	6
	Unemployed	5
Religion	Christianity	43
	Islam	57

Knowledge of ART and ART Adherence among Study Participants

Baseline assessment of the knowledge of study participants on ART adherence showed that 77% of participants had good knowledge of ART and ART Adherence, while 22% had moderate knowledge, and 1% had poor knowledge. There was, however, an

improvement during the end line examination, with 88% of participants having good knowledge and 12% recording moderate knowledge (Table 2). There was no significant difference between participants' knowledge of ART and ART adherence before and after the OTZ intervention (p-value=0.249) (Table 2).

Table 2. Participants' Knowledge of ART and ART Adherence

Item pool	**Variables**	**Percentage (%)**		**P-value**
		Baseline	**End line**	
ART suppresses the activity of HIV but does not cure the virus.	Yes	56	99	0.249
	No	40	0	
	Don't Know	4	1	
Know the name of your ART drug?	Yes	28	88	
	No	72	12	
Number of ARV tablets to take daily?	1 Tablet	100	100	
How to take ART about food intake?	After Meal	86	100	
	Before Meal	14	0	
Has your ART regimen ever been modified?	Yes	4	24	
	No	83	66	
	Don't Know	13	10	
How long should you take your ARV drugs?	For Life	95	100	
	Don't Know	5	0	
What is the purpose of ART?	To be Healthy	8.8	15	
	Reduce HIV effects	64	85	
	Don't Know	27	0	
What is the effect of ART on your health?	Make Me Healthy	82	100	
	Don't Know	18	0	
What is the effect of ART on CD4 count?	Increases CD4 count	51	73	
	Reduces CD4 count	12	1	
	Don't Know	37	26	
What is the effect of missed ART doses on treatment efficacy?	Causes Sickness	97	100	
	Don't Know	3	0	
Can ART prevent mother-to-child transmission of HIV?	Yes	85	97	
	No	10	3	
	Don't Know	5	0	
Classified Scores for knowledge of ART and ART adherence	Poor	1	0	
	Moderate	22	12	
	Good	77	88	

Knowledge of Viral Load and Viral Load Suppression among Study Participants

The study participants' knowledge of viral load and viral suppression differed in both enrolment (baseline and end-line), as shown in Table 3. The classified scores showed that 23% of participants had good knowledge, 76% had moderate knowledge, while 1% had poor knowledge at the baseline. This was improved upon during the end-line examination, with 43% and 57% of the participants having good and moderate knowledge, respectively. There was no significant difference between participants' knowledge of viral load and viral suppression before and after the OTZ intervention (p-value=0.060) (Table 3).

Table 3. Participants' Knowledge of Viral Load and Viral Load Suppression

Item pool	**Variables**	**Percentage (%)**		**P-value**
		Baseline	**End line**	0.060
What is viral load?	Amount of HIV in the blood	26	98	
	The tests we do in the Facility	48	2	
	Don't Know	26	0	
What is viral load suppression?	When the viral load is very low	45	97	
	Don't Know	55	3	
Where viral load test conducted?	Health facility	100	100	
Type of specimen for viral load test?	Blood	91	100	
	Don't Know	9	0	
How often is a viral load test conducted?	After 6 Months	21	95	
	After 12 Months	4	4	
	After some Months	71	1	
	Don't Know	4	0	
Purpose of a viral load test?	To check the amount of Virus in the blood	11	96	
	To check the blood	80	3	
	Don't Know	9	1	
Possible results of a viral load test?	High & Low	71	93	
	Virally Suppressed, Unsuppressed and Undetectable	16	2	
	Don't Know	13	5	
When last viral load test conducted?	1-4 Months	49	23	
	5-8 Months	34	3	
	8-12 Months	5	74	
	Don't Know	12	0	
Knowledge of the last viral load test result	Suppressed	34	80	
	Virally Unsuppressed	6	14	
	Virally undetectable	11	6	

	Don't Know	49	0	
Importance of viral suppression	To remain healthy	45	99	
	Don't Know	55	1	
Classified Score for knowledge of viral suppression	Poor	1	0	
	Moderate	76	57	
	Good	23	43	

Attitude on ART and ART Adherence among Study Participants

Results for attitude towards ART and ART adherence among the study participants during the baseline and end-line enrolment. Overall, classified scores for attitude regarding ART and ART adherence showed good ratings for 99% and 100% at the baseline and endline regime, respectively. There was no significant difference between participants' attitudes regarding ART and ART adherence before and after the OTZ intervention (p-value=0.148) (Table 4).

Table 4. Attitude Regarding ART and ART Adherence

Item pool	**Variables**	**Percentage (%)**		**P-value**
		Baseline	**End line**	
ART has a positive effect on health	Strongly Disagree	1	1	0.148
	Disagree	2	0	
	Undecided	11	1	
	Agree	21	50	
	Strongly Agree	65	48	
ART gives more benefits than harm	Strongly Disagree	1	4	
	Disagree	4	2	
	Undecided	15	1	
	Agree	22	93	
	Strongly Agree	58	0	
ART causes less financial difficulty	Strongly Disagree	5	4	
	Disagree	5	8	
	Undecided	13	11	
	Agree	63	60	
	Strongly Agree	14	17	
ART makes one feel forced to take medication	Strongly Disagree	1	9	
	Disagree	3	25	
	Undecided	1	15	
	Agree	93	41	
	Strongly Agree	2	10	
ART side effects can lead to organ damage	Strongly Disagree	0	9	
	Disagree	14	19	
	Undecided	1	22	
	Agree	82	41	
	Strongly Agree	3	9	
ART prolongs life	Strongly Disagree	0	4	

	Disagree	4	1	
	Undecided	9	4	
	Agree	83	57	
	Strongly Agree	4	34	
ART enhances the quality of life	Strongly Disagree	0	2	
	Disagree	1	0	
	Undecided	1	3	
	Agree	23	51	
	Strongly Agree	75	44	
ART helps one to gain weight/energy	Strongly Disagree	1	2	
	Disagree	0	0	
	Undecided	1	11	
	Agree	17	61	
	Strongly Agree	81	26	
ART reduces frequent sickness	Strongly Disagree	0	2	
	Disagree	0	0	
	Undecided	2	4	
	Agree	29	54	
	Strongly Agree	69	40	
ART assists in fulfilling family obligations	Strongly Disagree	1	1	
	Disagree	2	2	
	Undecided	14	14	
	Agree	58	58	
	Strongly Agree	25	25	
Classified Score for attitude regarding ART and ART adherence	Negative	1	0	
	Positive	99	100	

Attitude on Viral Load and Viral Load Suppression among Study Participants

Results of the attitude towards the viral load and viral load suppression obtained during the baseline and end-line enrolment are presented in Table 5. Classified scores before and after the OTZ intervention showed that 96% and 99% of participants had a good attitude regarding viral load and viral suppression, respectively. There was no significant difference between participants' attitudes regarding viral load and viral suppression before and after the OTZ intervention (p-value=1.000) (Table 5).

Table 5. Participants' Attitude Regarding Viral Load and Viral Suppression

Item pool	**Variables**	**Percentage (%)**		**P-value**
		Baseline	**End line**	
The goal of HIV treatment is to attain viral suppression	Strongly Disagree	0	0	1.000
	Disagree	1	1	
	Undecided	2	2	
	Agree	59	58	
	Strongly Agree	38	38	

Suppressed viral load gives more benefits than harm	Strongly Disagree	2	2	
	Disagree	2	2	
	Undecided	2	2	
	Agree	64	64	
	Strongly Agree	30	30	
Viral load test effectively measures the amount of virus in the blood	Strongly Disagree	2	2	
	Disagree	1	1	
	Undecided	2	2	
	Agree	62	62	
	Strongly Agree	33	33	
A suppressed viral load result reduces the risk of transmitting the virus to an uninfected person.	Strongly Disagree	4	4	
	Disagree	0	0	
	Undecided	2	2	
	Agree	63	63	
	Strongly Agree	31	31	
A suppressed viral load prolongs life.	Strongly Disagree	2	2	
	Disagree	0	0	
	Undecided	4	4	
	Agree	60	60	
	Strongly Agree	34	34	
A suppressed viral load enhances the quality of life	Strongly Disagree	2	2	
	Disagree	0	0	
	Undecided	2	2	
	Agree	61	61	
	Strongly Agree	35	35	
A suppressed viral load keeps the immune system working	Strongly Disagree	3	3	
	Disagree	0	0	
	Undecided	2	2	
	Agree	67	67	
	Strongly Agree	28	28	
Taking ART medication regularly and as directed decreases the viral load	Strongly Disagree	1	1	
	Undecided	1	1	
	Agree	63	63	
	Strongly Agree	35	35	
A suppressed viral load result promotes self-esteem	Strongly Disagree	8	8	
	Disagree	1	1	
	Undecided	8	8	
	Agree	79	79	
	Strongly Agree	4	4	
Suppressed viral load promotes PMTCT.	Strongly Disagree	2	2	
	Disagree	1	1	
	Undecided	3	3	
	Agree	60	60	
	Strongly Agree	34	34	

Classified Scores for attitude regarding viral load and viral sup	Negative	4	1	
	Positive	96	99	

Practice of ART and ART Adherence among Study Participants

The results obtained regarding ART practice and adherence among the study participants are presented in Table 4.9. The classified score showed that the practice regarding adherence to ARV among the study participants is rated good for both the baseline and end-line enrolment period, given by the percentage score of 99% and 100%, respectively. There was no significant difference between participants' practice of ART and ART adherence before and after the OTZ intervention (p-value=0.793) (Table 6).

Table 6. Practice Regarding ART and ART Adherence among the Study Participants

Item pool	Variables	Percentage (%)		P-value
		Baseline	End line	
Store ARV as recommended	Yes	90	100	0.793
	No	10	0	
Take ARV without support.	Yes	21	51	
	No	79	49	
Have missed doses of ARV within the last week	Yes	31	24	
	No	69	79	
Have a reminder to take ARV drugs	Yes	88	88	
	No	12	12	
Take the missed dose immediately, I remember.	Yes	82	82	
	No	18	18	
Practice self-medication	Yes	29	29	
	No	71	71	
Adhere to ARV refill schedules.	Yes	93	93	
	No	7	7	
Seek support to keep the clinic schedule	Yes	86	86	
	No	14	14	
Take ARV at any time that I am free	Yes	54	32	
	No	46	68	
Take a balanced diet to help with medication.	Yes	83	92	
	No	17	8	
Classified Score for ART and ART adherence	Poor	1	0	
	Good	99	100	

Practice of Viral Load and Viral Load Suppression among Study Participants

Classified scores showed that 67% of the participants had good practice towards Viral Load and Viral Load suppression, while 33% were engaged in poor practice during the baseline. This was, however, improved upon with 88% having good practice during the end

line. There was no significant difference between participants' practice of viral load and viral suppression before and after the OTZ intervention (p-value=0.604) (Table 7).

Table 7. Practice of Viral Load and Viral Load Suppression

Item pool	Variables	Percentage (%)		P-value
		Baseline	End line	
Conduct a viral load test as prescribed	Yes	92	93	0.604
	No	8	7	
Ever missed a viral load appointment within the last 6 months	Yes	60	35	
	No	40	65	
Seek support to run a viral load test	Yes	96	75	
	No	4	25	
Asked the health worker to explain the viral load result	Yes	9	73	
	No	91	27	
Interact with other AYAs on ARV medication	Yes	52	82	
	No	48	18	
Classified Score for the practice of viral load and viral suppression	Poor	33	12	
	Good	67	88	

Discussion

This study sought to assess the effect of the OTZ intervention on KAP of ART adherence and viral suppression among AYALHIV on ART in Niger state, north-central Nigeria.

Socio-Demographic Characteristics of Participants

The socio-demographic characteristics of the study participants revealed that 51% of the respondents are female compared to 49% male. The age disproportion varied, with 22% of participants being younger adolescents, 10-14 years, and 62% being older adolescents, between the ages of 15-19 years, respectively, while only 15% were young adults between the ages of 20-24 years. This result aligns with the reported HIV prevalence rate of 3.3% among adolescents in the Northcentral region of Nigeria [20]. The study revealed that the majority of the participants, totalling 98%, are single as against 1% each who are married and cohabiting. This result is not surprising because the study population was limited to adolescents and young adults (AYAs). Among the study participants, 3.9% had no form of education, 9.3% had primary education, 78.9% had secondary education, and 7.9% were currently in their tertiary education. The employment status of the participants varied, with the majority of the participants being students (89%). The participants belong to the two major religious groups in Nigeria, which are Islam (57%) and Christianity (43%) (Table 1).

Participants' Knowledge of ART and ART Adherence

This study showed that 77% of participants at baseline and 88% at end line had good knowledge of ART Adherence (Table 2). This result is similar to the 73.6% good knowledge score of ART and its effect among AYAs on ART in a tertiary hospital in Lagos, Nigeria [13]. There was no significant difference between participants' knowledge of ART and ART adherence before and after the OTZ intervention (p-value=0.249) (Table 3). This result follows the findings of [21]. They

reported that HIV-related knowledge was significantly better in the intervention group at end line, but no statistically significant differences were found for ART adherence after a social media support intervention among youths in Nigeria. Significant positive changes in knowledge, views and opinions regarding sexual and reproductive health were also observed following exposure to peer sessions of the MTV Shuga intervention across two states in northwestern Nigeria [22].

Participants' Knowledge of Viral Load and Viral Suppression

Classified scores showed that 23% and 43% of participants had good knowledge of viral suppression at baseline and endline, respectively, while 76% and 57% had moderate knowledge, respectively (Table 3). There was no statistically significant difference in participants' knowledge of viral load and viral suppression before and after the OTZ intervention (p-value=0.060) even though a similar study across 5 states found significant difference in viral load up take and suppression rates after exposure to the OTZ intervention among AYAs on ART in Nigeria [10].

Participants' Attitude Regarding ART and ART Adherence

Overall scores for attitude regarding ART adherence showed good ratings for 99% and 100% at the baseline and endline regime, respectively (Table 4). The result further showed that 93% pre-exposure and 41% post-exposure agreed that the ART regimen predisposed them to forced medication. This result is in line with the findings of [23] in Uganda, who reported that AYALHIV are frustrated with the burden of taking multiple medications daily.

Participants' Attitude Regarding Viral Load and Viral Suppression

Classified scores pre and post OTZ intervention showed that 96% and 99% of participants, respectively, had positive attitudes regarding viral load suppression (Table 5). Furthermore, 63% of the study participants during both enrolments agreed that taking ART medication regularly and as directed decreases viral load. This was equally strongly agreed by 35% of the participants in both enrolment periods. The result is not farfetched from the findings of [24], who reported that strict adherence to ART by PLHIV is necessary to suppress viral load and improve quality of life. There was no statistically significant difference in participants' attitude before and after the OTZ intervention (p-value=1.000).

Participants' Practice towards ART and ART Adherence

Results from this study also showed that the practice regarding adherence to ARV among the participants was 99% and 100% at baseline and end line, respectively (Table 6). This result is similar to findings in Nigeria [13], which reported moderate ART practices among AYALHIV. On the other hand, 31% of the study participants at baseline and 24% after exposure to OTZ have reportedly missed their ARV doses within the last week before data collection. The result is not new as studies have reportedly revealed that missing ARV doses is common among patients and particularly among AYALHIV [17]. Self-medication at home was also common among 29% of the study participants in both enrolments. This result is similar to the findings of [26], who reported that 100% of respondents prefer adopting self-medication.

Participants' Practice towards Viral Load and Viral Load Suppression

Classified scores showed that 67% of the participants had good practice towards Viral suppression before the intervention and 88% post-exposure (Table 7). This is similar to findings in Nigeria [19] where viral load coverage was found to increase significantly among AYALHIV 10-24 years after exposure

to OTZ intervention. However, 9% pre-exposure and 73% of the participants post-exposure have reportedly asked their healthcare provider to explain their viral load result, indicating improvement in their practices of viral load test (Table 7). This result conforms to the findings of [27] in Nigeria.

Conclusion

The OTZ intervention demonstrates potentials in improving the KAP of AYALHIV in Niger state, Nigeria. In general, this study reveals improvement in the KAP of ART adherence and viral suppression among the study participants. The study's findings contribute to the existing body of research on HIV treatment promotion interventions among the target population. Further research is necessary to confirm these findings and explore the scalability and sustainability of the OTZ intervention in Nigeria.

Recommendations

The following recommendations are made based on the findings of this study.

1. Future research to investigate the long-term effects of interventions like the OTZ on AYAs' Knowledge, Attitude and Practice regarding HIV treatment outcomes.
2. Healthcare institutions, as well as key actors in the healthcare system of Nigeria, should encourage the adoption of other evidence-based HIV prevention intervention programs such as DREAMS, YAPS, IMARA and BeT in combination with the OTZ to further reinforce positive behavior change among participants.

Limitations of the Study

The sample size was not achieved due to difficulty in obtaining consent and/or assent. Also, the study questionnaire was not self-administered and may have led to dishonesty in participants' responses since HIV may be considered a sensitive topic. Another limitation is that the study design did not allow for comparison with a control group to further attribute changes to the intervention. Future research should aim to address limitations and explore the long-term effects of the OTZ intervention.

Conflict of Interest

The authors hereby declare no known conflict of interest.

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