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Research Article

Knowledge and Perception towards ART Adherence among Female Sex Workers in Rivers State, Nigeria

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Abstract

Female sex workers (FSWs) face individual, occupational, and social barriers that may affect adherence to antiretroviral therapy (ART). This study assessed ART knowledge, perception, associated factors, and adherence among FSWs in Rivers State, Nigeria. A cross-sectional study was conducted among 394 FSWs accessing services at Diadem Consult Initiative between July and September 2025, selected by convenience sampling from 5,300 service users recorded between 2020 and 2024. Data were collected using medical records and interviewer-administered questionnaires and analysed with IBM SPSS Statistics version 27 using descriptive statistics and chi-square tests at $p < 0.05$. Good ART knowledge was observed among 348 (88.3%) respondents, while 46 (11.7%) had poor knowledge. Knowledge was high regarding daily medication (392; 99.5%), fixed timing (386; 98.0%), lifelong treatment (391; 99.2%), and missed-dose consequences (352; 89.3%), but lower for identifying TDF/3TC/DTG (185; 47.0%) and understanding ART's effect on CD4 counts (199; 50.5%). ART dispensing staff (348; 88.3%) and referring physicians (339; 86.0%) were the main information sources. Good perception was reported by 276 (70.0%), while 118 (30.0%) had poor perception. Most believed in ART effectiveness (365; 92.6%) and the need to continue treatment (378; 95.9%), although 308 (78.2%) felt ashamed of taking ART. Knowledge was significantly associated with religion ($\chi^2 = 9.307$, $p = 0.010$), education ($\chi^2 = 14.218$, $p < 0.001$), income ($\chi^2 = 11.412$, $p = 0.022$), ART initiation year ($\chi^2 = 9.716$, $p = 0.045$), support-group membership ($\chi^2 = 5.354$, $p = 0.021$), reminder use ($\chi^2 = 8.667$, $p = 0.003$), duration of sex work ($\chi^2 = 11.450$, $p < 0.001$), viral suppression ($\chi^2 = 8.580$, $p = 0.003$), and ART-related side effects ($\chi^2 = 10.653$, $p = 0.001$). Perception was associated with reminder use ($\chi^2 = 16.028$, $p < 0.001$) and duration of sex work ($\chi^2 = 6.382$, $p = 0.012$). Good adherence level (>90%) was achieved by 184 (46.7%) while 210 (53.3%) had poor adherence level. Knowledge and perception were not significantly associated with adherence. Despite generally good knowledge and perception, adherence was suboptimal. Interventions should address treatment knowledge gaps, stigma, and occupational barriers while strengthening confidential reminders and peer support.

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1. Introduction

Human immunodeficiency virus (HIV) remains a major public health challenge, although the expansion of antiretroviral therapy (ART) has substantially reduced HIV-related morbidity and mortality. Sustained treatment engagement and consistent medication use remain essential for achieving viral suppression and preventing treatment failure [1–4]. Current HIV guidance emphasizes lifelong ART, adherence support, differentiated service delivery and people-centred models of care [2–4]. Female sex workers (FSWs) are a key population disproportionately affected by HIV. UNAIDS continues to identify sex workers as experiencing substantial barriers to HIV prevention and treatment, including stigma, discrimination, violence and restrictive social and structural environments [1]. Evidence from sub-Saharan Africa further shows that FSWs experience treatment barriers at individual, interpersonal, occupational and health-system levels [5–8]. Knowledge is an important component of ART treatment literacy. Understanding the purpose of ART, dosing, timing, treatment duration, viral suppression and the consequences of missed doses may facilitate treatment engagement. However, evidence suggests that knowledge alone may not guarantee adherence. A systematic review of FSWs found that knowledge and treatment beliefs, food insecurity, substance use and sex-work-related circumstances can influence ART uptake and adherence [9]. Similarly, treatment literacy among FSWs has been associated with ART adherence and viral suppression, particularly knowledge of viral load and CD4 count [10]. Perception may also influence treatment behaviour. Although individuals may recognize the benefits of ART, concerns about stigma, disclosure, side effects and the visibility of medication may affect treatment practices. Among FSWs living with HIV in South Africa, HIV- and sex-work-related stigma has been associated with poorer quality of life [11], while qualitative evidence indicates that occupational environments can create difficulties with taking ART discreetly and attending treatment appointments [12]. Community-based and differentiated ART delivery may help overcome some of these barriers. Evidence from Tanzania and other sub-Saharan African settings indicates that community-based ART delivery can improve treatment initiation and reduce treatment interruptions among FSWs [13–15]. Digital adherence-support approaches, including mobile reminders, may also assist with medication-taking routines [16, 17]. The present study was conducted among FSWs accessing HIV treatment services through Diadem Consult Initiative in Rivers State. It examined knowledge and perception towards ART adherence and assessed their relationship with socio-demographic, healthcare and clinical characteristics.

2. Methods

2.1. Study design and participants

A cross-sectional study was conducted among female sex workers (FSWs) living with HIV/AIDS who received HIV-related services from Diadem Consult Initiative, a non-governmental organization in Obio/Akpor, Rivers State, Nigeria. The organization provides HIV testing, counselling, antiretroviral therapy (ART), adherence support and other HIV services for key populations through one-stop-shop and drop-in-centre arrangements. The study used both primary and secondary data. Secondary data were obtained from medical records of FSWs who accessed treatment services between 2020 and 2024, while primary data were collected using an interviewer-administered questionnaire during support-group meetings. The accessible population comprised 5,300 FSWs who accessed treatment services between 2020 and 2024, including 1,400 in 2020, 1,050 in 2021, 1,000 in 2022, 950 in 2023 and 900 in 2024. Eligible participants were FSWs aged $\geq$18 years who had engaged in sex work for money or goods within the preceding six months, were living with HIV, had received ART for at least six months at the facility, had complete relevant medical records, and resided in Rivers State. Newly diagnosed clients, those transferred to another facility, and those who had discontinued ART for at least three months were excluded.

2.2. Data Collection Instrument and Procedure

Data were collected using a structured data-abstraction form and an interviewer-administered questionnaire developed following a review of literature on ART adherence, treatment literacy, and factors influencing adherence among female sex workers (FSWs) and other people receiving HIV treatment [9, 13, 18]. The instruments covered socio-demographic, healthcare, knowledge, perception, and ART-adherence characteristics. Knowledge of ART was assessed using 10 questions covering ART regimen, dosage, timing, relationship with food, duration and purpose of treatment, viral load, CD4 count, consequences of missed doses, and prevention of mother-to-child transmission. Correct responses scored one point, while incorrect or "don't know" responses scored zero, giving a total score of 0–10. Respondents scoring 7–10 ($\geq$70%) were classified as having good knowledge, while those scoring 0–6 were classified as having poor knowledge. The questions covered key aspects of ART treatment literacy and adherence support [3, 4, 18]. Perception towards ART was assessed using six statements rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The statements addressed beliefs about ART effectiveness, continuation of treatment, potential harm from ART, the availability of more effective alternatives, conviction about HIV status, and shame associated with taking ART. Negatively worded items were reverse-coded before summation. The six item scores were summed to obtain a composite score ranging from 6 to 30 and converted to a percentage of the maximum possible score. Respondents scoring $\geq$70% were classified as having good perception, while those scoring below 70% were classified as having poor perception. This cut-off was adapted from a previous Nigerian study that applied a similar threshold for classifying perception [19]. For item-level descriptive analysis, responses were also recoded into "Yes" and "No" categories according to the direction of each statement. These dichotomized responses were used only for describing individual items; the overall perception category was determined from the reverse-coded Likert composite score. ART adherence was assessed using items covering missed doses, medication timing, stopping ART when ill, adherence diary cards, reasons for missed medication, concomitant medication use, and the number of days ART was missed during the preceding week and month. These items were informed by established approaches to ART adherence assessment and evidence on treatment experiences among FSWs [9, 20]. Responses were combined into a composite adherence score. Respondents who achieved $\geq$90% of the maximum obtainable score were classified as having good adherence, while those scoring below 90% were classified as having poor adherence. The questionnaire was reviewed by experts in HIV care, epidemiology, and public health. Construct validity of the knowledge items was assessed using principal component analysis, with factor loadings of at least 0.50 considered acceptable. Pre-testing yielded a Cronbach's alpha of 0.82, while repeat data abstraction produced a Cohen's kappa of 0.84.

2.3. Statistical Analysis

Data were cleaned, coded, and analysed using IBM SPSS Statistics version 27. Descriptive statistics, including frequencies and percentages, were used to summarize socio-demographic characteristics and the levels of knowledge, perception, and ART adherence. Composite scores were used to categorize respondents as having good or poor knowledge, good or poor perception, and good or poor ART adherence according to the predefined scoring criteria. Chi-square tests were used to assess associations between socio-demographic characteristics and each of the three key outcomes: knowledge, perception, and ART adherence. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Socio-demographic characteristics

The 394 female sex workers included in the study were predominantly aged 25–34 years (52.0%), and most first exchanged sex for money at ages 18–24 years (58.9%). The majority had never married (70.6%), were Christians (86.8%), and had secondary or tertiary education (79.4%). Monthly income was most commonly ₦71,000–₦100,000 (35.8%). Most respondent initiated ART in 2020 (63.2%). Regarding treatment support and disclosure, 56.3% had no treatment supporter, while 88.6% owned a telephone. Most were not members of a PLHIV support group (60.4%). HIV status had not been disclosed to a significant other by 52.8% or to a regular male sexual partner by 55.1%; similarly, 50.5% had not disclosed their ART use to a significant other. Respondents operated mainly from bars or lounges (25.9%), brothels (23.9%), and lodges (21.6%). Most used medicine reminder tools (82.2%). The majority had lived with HIV for 3–4 years (60.4%) and received ART for 3–4 years (61.4%), while 69.0% had engaged in sex work for at least five years. Viral suppression was recorded in 95.4% of respondents, whereas 58.1% reported side effects from their current ART regimen.

The sociodemographic and healthcare characteristics of the respondents are presented in Table 1.

Table 1: Socio-demographic and healthcare characteristics of female sex workers living with HIV/AIDS in Rivers State (n = 394)

Variable	Frequency (n)	Percentage (%)
Age at last birthday (years)		
18–24 years	53	13.5
25–34 years	205	52.0
35–44 years	110	27.9
≥45 years	26	6.6
Age at first exchange of sex for money (years)		
Below 18 years	78	19.8
18–24 years	232	58.9
≥25 years	84	21.3
Marital status		
Never married	278	70.6
Ever married (Married/Living with partner + Divorced/Widowed)	116	29.4
Religion		
Christianity	342	86.8
Islam	28	7.1
Other	24	6.1
Highest level of education		
<Secondary (No formal education + Primary)	81	20.6
≥Secondary(Secondary + Tertiary)	313	79.4
Monthly income (Naira)		
≤ 70,000	28	7.1
71,000–100,000	141	35.8
101,000–150,000	128	32.5
≥151,000	97	24.6
Year of ART initiation		
2020	249	63.2
2021	58	14.7
2022	40	10.2
2023	32	8.1
2024	15	3.8
Treatment supporter/partner		
No	222	56.3
Yes	172	43.7
Ownership of phone/telephone contact		
No	45	11.4
Yes	349	88.6

Table 1 Continuous

Variable	Frequency (n)	Percentage (%)
Membership of PLHIV association/support group		
No	238	60.4
Yes	156	39.6
HIV status disclosure to any significant other		
No	208	52.8
Yes	186	47.2
HIV status disclosure to regular male sexual partner		
No	217	55.1
Yes	177	44.9
ART disclosure to any significant other		
No	199	50.5
Yes	195	49.5
Operational location		
Lodge	85	21.6
Brothel	94	23.9
Bar/Lounge	102	25.9
Roadside	54	13.7
Home/Hook-up	59	15.0
Use of medicine reminder tool		
No	70	17.8
Yes	324	82.2
Duration of HIV infection (years)		
$\leq$2 years	38	9.6
3–4 years	238	60.4
$\geq$ 5 years	118	30.0
Duration of ART (years)		
$\leq$2 years	39	9.9
3–4 years	242	61.4
$\geq$ 5 years	113	28.7
Duration of sex work (years)		
$<$5 years	122	31.0
$\geq$ 5 years	272	69.0
Viral load suppression		
$\geq$1000 copies/ml	18	4.6
$<$1000 copies/ml	376	95.4
Side effects with current ART regimen		
No	165	41.9
Yes	229	58.1

3.2. Level of knowledge regarding ART

Knowledge of ART among female sex workers living with HIV/AIDS in Rivers State was generally high across most domains. Table 2 shows that overall, 348 (88.3%) respondents had good knowledge of ART, while 46 (11.7%) had poor knowledge. Only 185 (47.0%) correctly identified TDF/3TC/DTG as the common ART regimen, while 392 (99.5%) correctly reported taking one tablet daily, 386 (98.0%) knew ART should be taken at a fixed time, and 339 (86.0%) correctly identified its appropriate timing in relation to food. Almost all respondents, 391 (99.2%), knew ART is lifelong. Most understood that ART suppresses but does not cure HIV (360; 91.4%), reduces viral load to undetectable levels (345; 87.6%), and that missed doses reduce treatment effectiveness (352; 89.3%). Knowledge that ART increases CD4 count over time was moderate (199; 50.5%), while 367 (93.1%) correctly recognized its role in preventing mother-to-child transmission. Principal component analysis grouped the knowledge items into four components: ART regimen and administration, treatment outcomes, immunological and adherence-related effects, and prevention of mother-to-child transmission. Overall, 348 (88.3%) respondents had good knowledge, while 46 (11.7%) had poor knowledge.

Table 2: Knowledge of ART among female sex workers living with HIV/AIDS

Variables	n (%)	Principal Component Loading	Component
Name of ART regimen (TDF/3TC/DTG)	185 (47.0)	0.687	1
Number of tablets per day (1 tablet per day)	392 (99.5)	0.533	1
How ART should be taken (At a fixed time)	386 (98.0)	0.661	1
ART in relation to food (With or without food as recommended)	339 (86.0)	0.708	1
Duration of ART (Lifetime treatment)	391 (99.2)	0.594	1
Purpose of ART (Suppresses HIV, not cure)	360 (91.4)	0.695	2
Effect of ART on viral load (Reduces to undetectable levels)	345 (87.6)	0.726	2
Effect of ART on CD4 count (Increases CD4 over time)	199 (50.5)	0.791	3
Effect of missed doses (Reduces treatment efficacy)	352 (89.3)	0.516	3
ART prevents mother-to-child transmission (Yes)	367 (93.1)	0.853	4
Knowledge Level			
Poor Knowledge	46 (11.7)	-	-
Good Knowledge	348 (88.3)	-	-

3.3. Sources of information about ART

Healthcare professionals were the dominant sources of ART information. ART dispensing staff were reported by 88.3% of respondents, followed by referring physicians at 86.0%. Other sources included the internet (28.4%), patient information leaflets (17.8%), PLHIV associations (17.0%), other people living with HIV (15.5%), and family members or friends (5.6%).

Figure 1 presents the sources of information about ART among the respondents.

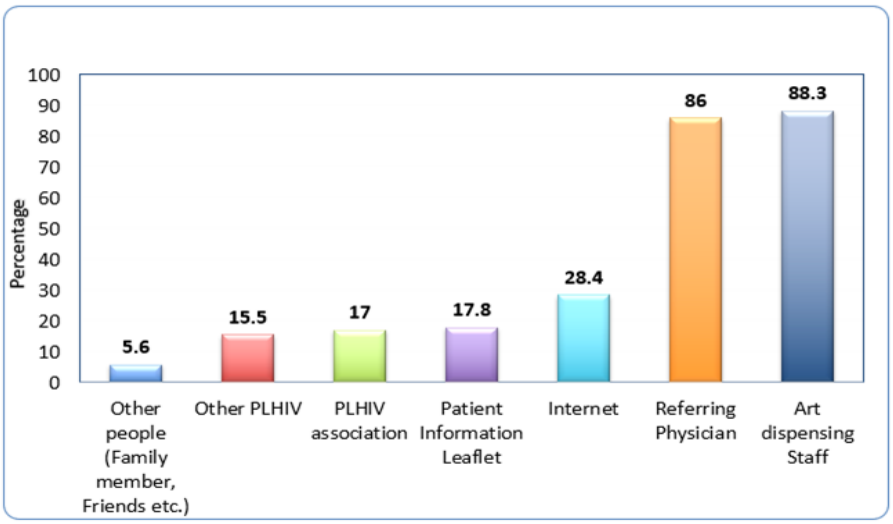


Figure 1: Sources of information regarding ART

3.4. Relationship between Sociodemographic and Clinical Characteristics With ART Knowledge

Significant associations with ART knowledge level were observed for religion ($\chi^2 = 9.307$, $p = 0.010$), educational attainment ($\chi^2 = 14.218$, $p < 0.001$), monthly income ($\chi^2 = 11.412$, $p = 0.022$), year of ART initiation ($\chi^2 = 9.716$, $p = 0.045$), PLHIV support group membership ($\chi^2 = 5.354$, $p = 0.021$), medicine reminder use ($\chi^2 = 8.667$, $p = 0.003$), duration of sex work ($\chi^2 = 11.450$, $p < 0.001$), viral load suppression ($\chi^2 = 8.580$, $p = 0.003$), and ART-related side effects ($\chi^2 = 10.653$, $p = 0.001$). Good knowledge was more common among respondents with at least secondary education, higher income, ART initiation in 2020, and membership of a PLHIV support group. Poor knowledge was more prevalent among respondents who had used medicine reminders, engaged in sex work for at least five years, had unsuppressed viral loads, or experienced ART-related side effects. Religion also differed by knowledge level, with Islam accounting for a larger proportion of respondents with poor knowledge than those with good knowledge. Duration of HIV infection, duration of ART use, treatment support, phone ownership, HIV-status disclosure, ART disclosure, and operational location were not significantly associated with knowledge level ($p > 0.05$).

The relationship between sociodemographic, healthcare and behavioural characteristics and ART knowledge is presented in Table 3.

Table 3: Relationship Between Socio-demographic, Healthcare and Behavioural Characteristics and Knowledge Level Among FSWs Living with HIV/AIDS

Variable	Poor Knowledge n (%)	Good Knowledge n (%)	Total N (%)	χ^2	p-value
Age at last birthday (years)				4.594	0.204
18–24 years	6 (13.0)	47 (13.5)	53 (13.5)		
25–34 years	30 (65.2)	175 (50.3)	205 (52.0)		
35–44 years	9 (19.6)	101 (29.0)	110 (27.9)		
≥45 years	1 (2.2)	25 (7.2)	26 (6.6)		
Age at first exchange of sex for money (years)				1.842	0.398
Below 18 years	13 (28.3)	65 (18.7)	78 (19.8)		
18–24 years	20 (43.5)	212 (60.9)	232 (58.9)		
≥25 years	13 (28.2)	71 (20.4)	84 (21.3)		
Marital status				0.512	0.474
Never married	35 (76.1)	243 (69.8)	278 (70.6)		
Ever married	11 (23.9)	105 (30.2)	116 (29.4)		
Religion				9.307	0.010*
Christianity	37 (80.4)	305 (87.6)	342 (86.8)		
Islam	8 (17.4)	20 (5.7)	28 (7.1)		
Other	1 (2.2)	23 (6.6)	24 (6.1)		
Highest level of education				14.218	<0.001*
Less than secondary	23 (50.0)	58 (16.7)	81 (20.6)		
Secondary and tertiary	23 (50.0)	290 (83.3)	313 (79.4)		
Monthly income (₦)				11.412	0.022*
<70,000	8 (17.4)	20 (5.7)	28 (7.1)		
71,000–100,000	15 (32.6)	126 (36.2)	141 (35.8)		
101,000–150,000	18 (39.1)	110 (31.6)	128 (32.5)		
≥151,000	5 (10.9)	92 (26.5)	97 (24.6)		
Year of ART initiation				9.716	0.045*
2020	21 (45.7)	228 (65.5)	249 (63.2)		
2021	8 (17.4)	50 (14.4)	58 (14.7)		
2022	6 (13.0)	34 (9.8)	40 (10.2)		
2023	7 (15.2)	25 (7.2)	32 (8.1)		
2024	4 (8.7)	11 (3.2)	15 (3.8)		
Treatment supporter/partner				0.001	0.98
No	26 (56.5)	196 (56.3)	222 (56.3)		
Yes	20 (43.5)	152 (43.7)	172 (43.7)		
Ownership of phone/telephone contact				0.016	0.9
No	5 (10.9)	40 (11.5)	45 (11.4)		
Yes	41 (89.1)	308 (88.5)	349 (88.6)		
Membership of PLHIV association/ support group				5.354	0.021*
No	35 (76.1)	203 (58.3)	238 (60.4)		

Yes	11 (23.9)	145 (41.7)	156 (39.6)		
HIV status disclosure to any significant other				0.291	0.59
No	26 (56.5)	182 (52.3)	208 (52.8)		
Yes	20 (43.5)	166 (47.7)	186 (47.2)		
HIV status disclosure to regular male sexual partner				0.011	0.916
No	25 (54.3)	192 (55.2)	217 (55.1)		
Yes	21 (45.7)	156 (44.8)	177 (44.9)		
ART disclosure to any significant other				0.754	0.385
No	26 (56.5)	173 (49.7)	199 (50.5)		
Yes	20 (43.5)	175 (50.3)	195 (49.5)		
Operational location				5.046	0.283
Lodge	14 (30.4)	71 (20.4)	85 (21.6)		
Brothel	8 (17.4)	86 (24.7)	94 (23.9)		
Bar/Lounge	10 (21.7)	92 (26.4)	102 (25.9)		
Roadside	9 (19.6)	45 (12.9)	54 (13.7)		
Home/Hook-up	5 (10.9)	54 (15.5)	59 (15.0)		
Use of medicine reminder tool				8.667	0.003*
No	1 (2.2)	69 (19.8)	70 (17.8)		
Yes	45 (97.8)	279 (80.2)	324 (82.2)		
Duration of HIV infection (years)				1.942	0.379
≤2 years	6 (13.0)	32 (9.2)	38 (9.6)		
3–4 years	35 (76.1)	203 (58.3)	238 (60.4)		
≥5 years	5 (10.9)	113 (32.5)	118 (30.0)		
Duration of ART use (years)				2.115	0.347
≤2 years	6 (13.0)	33 (9.5)	39 (9.9)		
3–4 years	36 (78.3)	206 (59.2)	242 (61.4)		
≥5 years	4 (8.7)	109 (31.3)	113 (28.7)		
Duration of sex work (years)				11.45	<0.001*
<5 years	5 (10.9)	117 (33.6)	122 (31.0)		
≥5 years	41 (89.1)	231 (66.4)	272 (69.0)		
Viral load suppression				8.58	0.003*
≥1,000 copies/mL	6 (13.0)	12 (3.4)	18 (4.6)		
<1,000 copies/mL	40 (87.0)	336 (96.6)	376 (95.4)		
Side effects with current ART regimen				10.653	0.001*
No	9 (19.6)	156 (44.8)	165 (41.9)		
Yes	37 (80.4)	192 (55.2)	229 (58.1)		

3.5. Level of Perception towards ART

The perception results presented in Tables 4 and 5 showed that 365 (92.6%) respondents were convinced of their HIV status, while 365 (92.6%) believed in the effectiveness of ART. A total of 378 (95.9%) were convinced of the need to continue treatment. Most respondents disagreed or strongly disagreed that more effective alternatives to ART existed 338 (85.8%) or that ART did more harm than good 353 (89.6%). However, 308 (78.2%) agreed or strongly agreed that they felt ashamed of taking ART. Overall, 276 (70.0%) respondents had good perception of ART adherence, while 118 (30.0%) had poor perception. Most were convinced of their HIV status and ART effectiveness 365 (92.6% each) and the need to continue treatment 378 (95.9%). Most rejected the beliefs that more effective alternatives to ART existed 356 (90.4%) or that ART did more harm than good 369 (93.7%). However, 308 (78.2%) reported feeling ashamed of taking ART.

Table 4: Perception of Female Sex Workers in Nigeria Regarding Antiretroviral Therapy

Perception Statement / Variable	Strongly Disagree (SD) n (%)	Disagree (D) n (%)	Undecided (U) n (%)	Agree (A) n (%)	Strongly Agree (SA) n (%)
There are more effective ways than ART	215 (54.6)	123 (31.2)	18 (4.6)	26 (6.6)	12 (3.0)
I am convinced of being infected by HIV	8 (2.0)	9 (2.3)	12 (3.0)	145 (36.8)	220 (55.8)
I am convinced of the effectiveness of ART	6 (1.5)	8 (2.0)	15 (3.8)	162 (41.1)	203 (51.5)
Taking ART does more harm than good	220 (55.8)	133 (33.8)	16 (4.1)	17 (4.3)	8 (2.0)
I am convinced that I should continue my ART	4 (1.0)	2 (0.5)	10 (2.5)	151 (38.3)	227 (57.6)
I feel ashamed to take my ART	42 (10.7)	44 (11.2)	0 (0.0)	184 (46.7)	124 (31.5)

Table 5: Perception Level of ART Adherence Among Female Sex Workers in Rivers State (n = 394)

Variable / Perception Statement	Frequency (n)	Percentage (%)
Overall perception level		
Poor perception	118	30.0
Good perception	276	70.0
There are more effective ways than ART		
No	356	90.4
Yes	38	9.6
Convinced of being infected with HIV		
No	29	7.4
Yes	365	92.6
Convinced of the effectiveness of ART		
No	29	7.4
Yes	365	92.6
Taking ART does more harm than good		
No	369	93.7
Yes	25	6.3
Convinced to continue ART		
No	16	4.1
Yes	378	95.9
Feel ashamed to take ART		
No	86	21.8
Yes	308	78.2

3.6. Relationship Between Sociodemographic, Behavioural, and Clinical Characteristics and Perception Level

Table 6 shows the relationship between sociodemographic, behavioural, and clinical characteristics and perception level.

Overall, 276 (70.0%) respondents had good perceptions of ART adherence, while 118 (30.0%) had poor perceptions. Medicine reminder use ($\chi^2 = 16.028$, $p < 0.001$) and duration of sex work ($\chi^2 = 6.382$, $p = 0.012$) were significantly associated with perception level. Medicine reminder use was reported by 84.8% of respondents with good perception compared with 59.0% of those with poor perception. Similarly, 71.0% of respondents with good perception had engaged in sex work for at least five years, compared with 51.3% of those with poor perception. No significant associations were observed for age ($\chi^2 = 4.625$, $p = 0.201$), age at first exchange of sex for money ($\chi^2 = 2.703$, $p = 0.440$), marital status ($\chi^2 = 2.047$, $p = 0.359$), religion ($\chi^2 = 2.466$, $p = 0.291$), educational attainment ($\chi^2 = 0.151$, $p = 0.985$), monthly income ($\chi^2 = 8.034$, $p = 0.090$), year of ART initiation ($\chi^2 = 6.564$, $p = 0.161$), treatment supporter status ($\chi^2 = 0.475$, $p = 0.491$), phone ownership ($\chi^2 = 0.058$, $p = 0.810$), support-group membership ($\chi^2 = 2.347$, $p = 0.125$), HIV-status disclosure to a significant other ($\chi^2 = 0.664$, $p = 0.415$), disclosure to a regular male sexual partner ($\chi^2 = 0.252$, $p = 0.616$), ART disclosure ($\chi^2 = 0.010$, $p = 0.919$), operational location ($\chi^2 = 4.774$, $p = 0.311$), duration of HIV infection ($\chi^2 = 1.664$, $p = 0.435$), duration of ART use ($\chi^2 = 0.959$, $p = 0.619$), viral suppression ($\chi^2 = 0.399$, $p = 0.528$), and ART-related side effects ($\chi^2 = 0.832$, $p = 0.362$).

Table 6: Relationship Between Socio-demographic, Healthcare and Clinical Characteristics and Perception Level Among FSWs Living with HIV/AIDS

Variable	Poor Perception n (%)	Good Perception n (%)	Total N (%)	χ^2	p-value
Age (years)				4.625	0.201
18–24 years	4 (10.3)	49 (13.8)	53 (13.5)		
25–34 years	26 (66.7)	179 (50.4)	205 (52.0)		
35–44 years	6 (15.4)	104 (29.3)	110 (27.9)		
≥45 years	3 (7.7)	23 (6.5)	26 (6.6)		
Age at first exchange of sex for money (years)				2.703	0.440
Below 18 years	6 (15.4)	72 (20.3)	78 (19.8)		
18–24 years	24 (61.5)	208 (58.6)	232 (58.9)		
≥25 years	9 (23.1)	75 (21.1)	84 (21.3)		
Marital status				2.047	0.359
Never married	31 (79.5)	247 (69.6)	278 (70.6)		
Ever married	8 (20.5)	108 (30.4)	116 (29.4)		
Religion				2.466	0.291
Christianity	37 (94.9)	305 (85.9)	342 (86.8)		
Islam	1 (2.6)	27 (7.6)	28 (7.1)		
Other	1 (2.6)	23 (6.5)	24 (6.1)		
Highest level of education				0.151	0.985
No formal/primary	8 (20.5)	73 (20.6)	81 (20.6)		
Secondary/tertiary	31 (79.5)	282 (79.4)	313 (79.4)		
Monthly income (₦)				8.034	0.090
≤70,000	6 (15.4)	22 (6.2)	28 (7.1)		
71,000–100,000	16 (41.0)	125 (35.2)	141 (35.8)		
101,000–150,000	8 (20.5)	120 (33.8)	128 (32.5)		
>150,000	9 (23.1)	88 (24.8)	97 (24.6)		
Year of ART initiation				6.564	0.161
2020	31 (79.5)	218 (61.4)	249 (63.2)		
2021	3 (7.7)	55 (15.5)	58 (14.7)		
2022	4 (10.3)	36 (10.1)	40 (10.2)		
2023	1 (2.6)	31 (8.7)	32 (8.1)		
2024	0 (0.0)	15 (4.2)	15 (3.8)		
Treatment supporter/partner				0.475	0.491
No	24 (61.5)	198 (55.8)	222 (56.3)		
Yes	15 (38.5)	157 (44.2)	172 (43.7)		
Ownership of phone/telephone contact				0.058	0.810
No	4 (10.3)	41 (11.5)	45 (11.4)		
Yes	35 (89.7)	314 (88.5)	349 (88.6)		
Membership of PLHIV association/support group				2.347	0.125
No	28 (71.8)	210 (59.2)	238 (60.4)		

Yes	11 (28.2)	145 (40.8)	156 (39.6)		
HIV status disclosure to any significant other				0.664	0.415
No	23 (59.0)	185 (52.1)	208 (52.8)		
Yes	16 (41.0)	170 (47.9)	186 (47.2)		
HIV status disclosure to regular male sexual partner				0.252	0.616
No	20 (51.3)	197 (55.5)	217 (55.1)		
Yes	19 (48.7)	158 (44.5)	177 (44.9)		
ART disclosure to any significant other				0.010	0.919
No	20 (51.3)	179 (50.4)	199 (50.5)		
Yes	19 (48.7)	176 (49.6)	195 (49.5)		
Operational location				4.774	0.311
Lodge	13 (33.3)	72 (20.3)	85 (21.6)		
Brothel	7 (17.9)	87 (24.5)	94 (23.9)		
Bar/lounge	11 (28.2)	91 (25.6)	102 (25.9)		
Roadside	3 (7.7)	51 (14.4)	54 (13.7)		
Home/hook-up	5 (12.8)	54 (15.2)	59 (15.0)		
Use of medicine reminder tool				16.028	0.0001*
No	16 (41.0)	54 (15.2)	70 (17.8)		
Yes	23 (59.0)	301 (84.8)	324 (82.2)		
Duration of HIV infection (years)				1.664	0.435
≥2 years	0 (0.0)	38 (10.7)	38 (9.6)		
3–4 years	33 (84.6)	205 (57.7)	238 (60.4)		
≤5 years	6 (15.4)	112 (31.5)	118 (30.0)		
Duration of ART use (years)				0.959	0.619
≤2 years	0 (0.0)	39 (11.0)	39 (9.9)		
3–4 years	32 (82.1)	210 (59.2)	242 (61.4)		
≤5 years	7 (17.9)	106 (29.9)	113 (28.7)		
Duration of sex work (years)				6.382	0.012*
<5 years	19 (48.7)	103 (29.0)	122 (31.0)		
≥5 years	20 (51.3)	252 (71.0)	272 (69.0)		
Viral suppression				0.399	0.528
No	1 (2.6)	17 (4.8)	18 (4.6)		
Yes	38 (97.4)	338 (95.2)	376 (95.4)		
Side effects with current ART regimen				0.832	0.362
No	19 (48.7)	146 (41.1)	165 (41.9)		
Yes	20 (51.3)	209 (58.9)	229 (58.1)		

3.7. Adherence to ART among FSWs

Table 7 shows that 183 (46.4%) respondents achieved optimal adherence (≥90%), while 211 (53.6%) did not. Concomitant medication use was reported by 178 (45.2%), while 170 (43.1%) reported none and 46 (11.7%) were unsure. Most respondents, 371 (94.2%), had ever forgotten to take ART. Only 75 (19.0%) possessed an adherence diary card, while 319 (81.0%) did not. Although 289 (73.4%) reported taking ART at the indicated time, 101 (25.6%) did not. Most respondents, 329 (83.5%), did not stop ART when ill, whereas 62 (15.7%) reported doing so. In the preceding week, 287 (72.8%) reported no missed doses, 90 (22.8%) missed one day, 7 (1.8%) missed 2–3 days, 2 (0.5%) missed 4–5 days, and 6 (1.5%) missed more than five days; 2 (0.5%) were unsure. In the preceding month, 103 (26.1%) reported no missed doses, 238 (60.4%) missed 1–2 days, 26 (6.6%) missed 3–5 days, and 9 (2.3%) missed 6–10 days, while 18 (4.6%) were unsure. Overall, adherence was suboptimal, with 211 (53.6%) classified as having poor adherence and 183 (46.4%) as having good adherence based on the ≥90% adherence criterion.

Table 7: Adherence to Antiretroviral Therapy Among Female Sex Workers Living with HIV/AIDS

Variable	Frequency (n)	Percentage (%)
Adherence ≥90%		
No	211	53.6
Yes	183	46.4
History of concomitant medication in the last month		
No	170	43.1
Yes	178	45.2
I don't know	46	11.7
Ever forget to take ART medication		
No	20	5.1
Yes	371	94.2
I don't know	3	0.8
Possession of adherence diary card		
No	319	81.0
Yes	75	19.0
Always take ART at the indicated time		
No	101	25.6
Yes	289	73.4
I don't know	4	1.0
Stops ART when feeling sick		
No	329	83.5
Yes	62	15.7
I don't know	3	0.8
Number of days ART was forgotten in the last week		
None	287	72.8
1 day	90	22.8
2–3 days	7	1.8
4–5 days	2	0.5
>5 days	6	1.5
I don't know	2	0.5
Number of days ART was forgotten in the last month		
None	103	26.1
1–2 days	238	60.4
3–5 days	26	6.6
6–10 days	9	2.3
I don't know	18	4.6
Adherence Level		
Poor Adherence	210	53.3
Good Adherence	184	46.7

3.7.1. Reason for missing ART

Figure 2 shows that the most common reason for missing ART was being away from home (85.7%), followed by running out of pills (53.3%) and being too busy (46.9%). Forgetting to take ART was reported by 40.1%, while side effects were the least reported reason (3.8%).

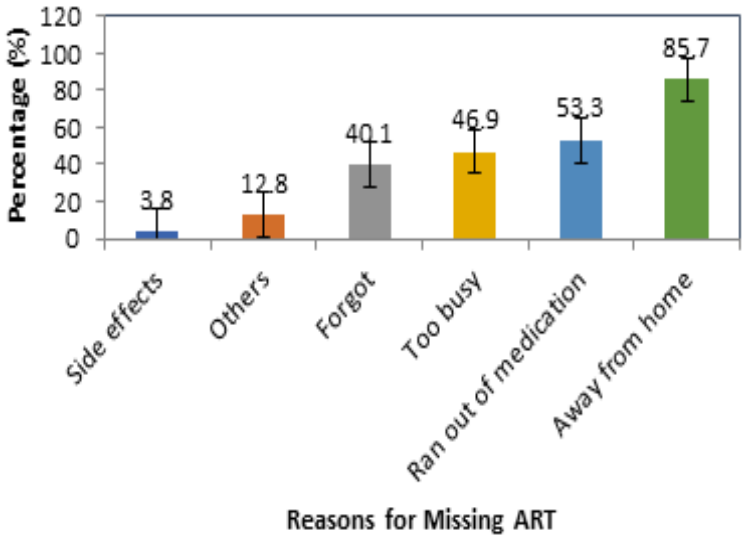


Figure 2: Reason for Missing Anti-Retroviral Therapy Among Female Sex Workers

4. Discussion

This study found that most female sex workers (FSWs) had good knowledge of antiretroviral therapy (ART), although important knowledge gaps remained. While respondents demonstrated strong understanding of daily dosage, fixed dosing time, lifelong treatment, ART effectiveness, and prevention of mother-to-child transmission, knowledge of the common ART regimen and the effect of ART on CD4 cell count was less comprehensive. These findings suggest that general awareness of ART does not necessarily translate into comprehensive treatment literacy. This is consistent with evidence that ART knowledge varies across specific treatment domains among FSWs [9, 10, 21]. The findings highlight the need for ART education to extend beyond general treatment instructions to include regimen identification, viral load monitoring, CD4 cell count, and the importance of sustained treatment. Knowledge level was associated with religion, educational attainment, monthly income, year of ART initiation, membership of a people living with HIV (PLHIV) association or support group, medicine-reminder use, duration of sex work, viral suppression, and experience of ART-related side effects. Respondents with higher educational attainment and monthly incomes were more represented among those with good knowledge, suggesting that educational and socioeconomic circumstances may influence access to and understanding of treatment information. Membership of a PLHIV support group was also associated with knowledge level, highlighting the potential contribution of peer support and shared treatment experiences to treatment literacy. However, these cross-sectional associations do not establish causality. Respondents who initiated ART earlier appeared to have better knowledge than those who initiated treatment more recently. This pattern may reflect differences in exposure to treatment counselling over time, although the study design cannot confirm this explanation. Poor knowledge was also more prevalent among respondents with longer sex-work experience, those who experienced ART-related side effects, and those with unsuppressed viral loads. These findings indicate that prolonged exposure to HIV services does not necessarily ensure comprehensive treatment knowledge. They also support the need for repeated, tailored counselling throughout treatment, particularly on side-effect management and the relationship between adherence, viral suppression, and immune recovery. Previous research has similarly highlighted the importance of treatment literacy and the influence of socioeconomic and structural factors on HIV treatment outcomes among FSWs [5, 6, 10, 22, 23]. Overall, respondents generally had favourable perceptions of ART. Most believed in its effectiveness, rejected the view that treatment did more harm than good, and expressed conviction about the need to continue treatment. Nevertheless, feelings of shame associated with taking ART remained an important concern. This finding reveals a distinction between favourable beliefs about treatment and the emotional or social challenges associated with taking medication. Stigma related to HIV status and sex work may contribute to concerns about disclosure and medication-taking in public or workplace settings [11, 12, 24]. Consequently, positive perceptions of ART should not be interpreted as an absence of stigma-related barriers. Counselling and support services should address confidentiality, anticipated discrimination, and strategies for taking medication safely and discreetly. Perception level was associated with medicine-reminder use and duration of sex work. Medicine-reminder use was more common among respondents with favourable perceptions, while those with longer sex-work experience were also more represented among respondents with good perceptions. These findings suggest that treatment-related practices and occupational experience may be linked to perceptions of ART, although the cross-sectional design does not establish the direction of these relationships. No significant associations were observed between perception level and the other sociodemographic, treatment-related, disclosure, and clinical characteristics examined. These findings suggest that favourable perceptions may be shaped by a combination of personal experiences and treatment-related practices rather than by demographic characteristics alone. Despite generally favourable levels of knowledge and perceptions, ART adherence remained suboptimal, with poor adherence more prevalent than good adherence. This discrepancy suggests that knowledge and positive perceptions alone may not be sufficient to ensure consistent medication-taking. ART adherence is influenced by interacting individual, interpersonal, occupational, and structural circumstances, including stigma, mobility, irregular work schedules, concerns about disclosure, and difficulties accessing services [5, 9, 12, 23, 25]. Although treatment literacy may support adherence and viral suppression [10], its benefits may be limited when practical barriers remain unresolved. These findings reinforce the need to combine treatment education with accessible, confidential, and differentiated adherence support. Medicine-reminder use was common among respondents. However, the association between reminder use and knowledge level indicated that reminders were also used by respondents with inadequate knowledge. This suggests that reminders may serve as practical aids even when treatment knowledge is incomplete. Reminder systems should therefore complement, rather than replace, comprehensive

ART counselling. Mobile-based reminders may support treatment routines, but interventions should be discreet and designed to minimise inadvertent disclosure of HIV status [16, 17, 26]. HIV programmes should strengthen continuous ART education, particularly regarding regimen identification, CD4 cell count, viral load, and side-effect management. Peer-support opportunities and confidential counselling should be maintained, while adherence interventions should address stigma and the occupational realities of FSWs. Discreet reminders, flexible access to ART services, and differentiated service delivery may help address barriers to sustained treatment. Integrating these approaches could improve treatment literacy, address psychosocial and practical challenges, and support sustained ART adherence among FSWs.

Study Limitation and Strength

A major strength was the combination of questionnaire data with clinical information, allowing knowledge and perception to be considered alongside treatment-related characteristics. The instrument also demonstrated good reliability. The cross-sectional design limits causal interpretation, while convenience sampling may restrict generalizability. Self-reported adherence and perception may also be affected by recall and social-desirability bias. HIV programmes should strengthen ART education on regimen identification, viral load, CD4 count and side-effect management while maintaining confidential, differentiated and accessible services. Adherence support should also consider the occupational realities of FSWs and incorporate discreet reminder systems and flexible treatment access.

5. Conclusions

Female sex workers living with HIV/AIDS in Rivers State demonstrated good knowledge and positive perceptions of ART, although a notable gap remained in ART regimen identification. However, good knowledge and positive perceptions did not necessarily translate into optimal adherence. HIV programmes should strengthen ART education, stigma reduction, peer support, medication reminders, and flexible treatment services for FSWs.

Abbreviations

AIDS: Acquired immunodeficiency syndrome
ART: Antiretroviral therapy
ARV: Antiretroviral
CD4: Cluster of differentiation 4
FSWs: Female sex workers
HIV: Human immunodeficiency virus
PLHIV: People living with HIV
SMAQ: Simplified Medication Adherence Questionnaire
UNAIDS: Joint United Nations Programme on HIV/AIDS
WHO: World Health Organization

Article Information

Ethical Approval: Ethical approval was obtained from the Faculty of Basic Medical Sciences Research Ethics Committee, Rivers State University (RSU/FBMS/REC/25/260). Permission to access relevant records was obtained from Diadem Consult Initiative.

Consent for publication: Not applicable.

Informed Consent: Written informed consent was obtained from all participants before participation in the study.

Data Availability: The study involved sensitive HIV-related information from a key population. The underlying individual-level dataset is not presented publicly in this manuscript to protect participant confidentiality. Access to de-identified data should be subject to the approval of the relevant institutional and programme authorities.

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