

Retention in Care and Treatment Adherence to Antiretroviral Therapy (Art), And Its Associated Factors Among Pregnant and Lactating HIV Positive Women in Hawassa Public Health Facilities, Sidama, Ethiopia: Retrospective Cross-Sectional Study

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Abstract

Background: Retention in care and treatment adherence to antiretroviral therapy (ART) among people living with HIV (PLHIV) is essential for longer existence, good quality of life, and minimizing HIV transmission. Few studies in Ethiopia were focusing more on pregnant HIV patients but it is also important to include lactating HIV positive patients as they are at risk of transmitting HIV to their child. Therefore, this study aimed to determine the level of retention in care and treatment adherence to antiretroviral therapy (ART), and its associated factors among pregnant and lactating HIV-positive women in Hawassa public health facilities, Sidama, Ethiopia, 2021.

Methods: Institution-based retrospective cross-sectional study was conducted from January 1, 2016-December 31, 2020, on a total sample size of 223. Pregnant and lactating HIV-positive women registered on the PMTCT logbook were selected by using simple random sampling techniques. Data were collected by using a structured data abstraction form. The data were entered to EpiData V4.4.2.1 and analyzed using SPSS Version 25. Bivariate and multivariate logistic regressions were undertaken to see the association between variables. Adjusted odds ratio (AOR) with 95% confidence interval (95%CI) and p-value <0.05 was used to declare the significance.

Results: The overall levels of retention in care and treatment adherence to ART were 85.7% and 88.3% respectively. Secondary and above education level [AOR =3.67, 95%CI (1.18, 11.4)], functional working status [AOR = 4.5, 95% CI (1.9, 10.82)] and HIV status disclosure to partner [AOR = 5.7, 95% CI (2.25, 14.71)] were identified as associated factors with retention in care. Baseline WHO stages I/II [AOR = 2.5, 95% CI: (1.04, 5.99)] was identified as the associated factor with treatment adherence level to ART.

Conclusions: The levels of retention in care and treatment adherence to ART in the current study were suboptimal compared to the national target. Secondary and above education level, baseline working functional status, and HIV status disclosures were associated with retention in care, whereas baseline WHO stages I/II was associated with treatment adherence. All concerned body should develop strategies on tracking lost to follow-up clients and encouraging a woman for disclosing their HIV status to their partners.

Keywords: retention; adherence; ART; Hawassa; ethiopia

Background

The WHO has defined retention in care as the continuous engagement in the care from diagnosis in a package of prevention, treatment, support and care services [1]. Treatment adherence had defined as “the extent to which a person’s behavior-taking medications, following a diet and/or executing lifestyle changes-corresponds with agreed recommendations from a health care provider” [2]. Retention in care and treatment adherence to antiretroviral therapy (ART) among people living with

HIV (PLHIV) are essential for longer existence, good quality of life, and minimizing HIV transmission [3]. The risk of transmission from mother to child is 15% to 45%. However, Antiretroviral therapy (ART) and other effective interventions during pregnancy, childbirth, or breastfeeding can reduce the risk below 5% [4-6]. Globally by the end of 2019, 38 million people worldwide were infected with HIV. Sub-Saharan Africa contributes over two-thirds of the global burden, with the majority of 59% being girls and women [7]. According to Joint United Nations Program on HIV/AIDS reported that children newly

infected with HIV were 160,000 globally, in which more than 90% of cases were from sub-Saharan Africa. Mother-to-child transmission is still one of the major sources of HIV infection among young children and it accounts for 9% worldwide [8, 9]. According to the Ethiopian DHS 2016 report, HIV prevalence among women aged 15-49 years was 1.2% [10]. Socio-demographic factors, baseline clinical and Health service factors, and patient-related related factors were reported as they have an effect on retention in care and treatment adherence to ART [11].

Due to option B+, the number of new HIV infections among children has declined by 53% between 2010 and 2019 [4]. However, retention in care and treatment adherence to ART is a major challenge for most pregnant and breastfeeding patients. Most of the losses among pregnant and breastfeeding patients occurred early after initiation [12]. Since the implementation of Option B+, one in every four pregnant women in Sub-Saharan Africa has been lost to follow-up within 6 months of ART initiation [13]. In Ethiopia, poor retention in care among HIV patients remains a major challenge [14, 15]. Available data nationally showed that lost to follow-up (LTFU) among pregnant and lactating HIV patients were high. Studies conducted in East Wollega and South Wollo showed that lost to follow-up among pregnant and lactating women from the Option B+ PMTCT program was 15.4% and among 330 women with a follow-up time of 16.9 months, lost to follow up was 9/1000 person-months respectively [16,17]. Various studies in Ethiopia showed a low level of treatment adherence among them, studies conducted in Tigray [18], South wollo[17], and Hadya [19] showed that 12.9%, 12.3%, and 17% of participants don't have good adherence to option B+ PMTCT respectively.

Joint United Nations Programme on HIV/AIDS for 2025 include having 90% of HIV-positive women on antiretroviral therapy prior to their current pregnancy, achieving 95% viral suppression before delivery, and achieving 95% viral suppression while breastfeeding [20]. Globally as well as nationally, different strategies and approaches have been developed and implemented to reduce the rate of transmission of HIV from mother to child. One of these approaches, which is currently under implementation, was Option B+, which is an approach that all pregnant and lactating women living with HIV initiate lifelong ART regardless of WHO clinical stage and CD4 cell count [21]. Ethiopia is one of the countries that have adopted universal

treatment in 2018 and advocated the importance of rapid initiation of ART [4]. To retain women in care and assure treatment adherence to ART, different efforts were undertaken. These are: PMTCT program is still on implementation to prevent transmission of HIV from mothers to their babies [22]. In addition, the health sector response to HIV is one of the targets of Sustainable Development Goals (SDGs) and the health extension workers were used to provide information and services to communities [23].

Few studies in Ethiopia were focusing more on pregnant HIV positive patients but it is also important to include lactating HIV positive patients as they are at risk of transmitting HIV to their child. Furthermore, none of the previous studies addressed both retention in care and treatment adherence to ART issues among pregnant and lactating HIV positive women in the study area [24]. Then it provides information for health care professionals on important determinants of retention in care and treatment adherence to ART. It might assist town health program planners, local NGOs, and other interested bodies to understand challenges that pregnant and lactating HIV positive women face and help to develop evidence-based interventions and foundation of potential corrective measures. Therefore, this study was aimed to assess the level of retention in care and treatment adherence, and identify associated factors among pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia.

Methods

Study area

The study was conducted at Hawassa town. It is located 275 Km South of Addis Ababa, the capital city of Ethiopia. The Hawassa city administration is subdivided into 8 sub-cities and the estimated total population size in 2017 was 455,658 as projected from the 2007 Ethiopian national census [25]. There are three governmental hospitals, 4 private primary hospitals, 12 health centers, and many public and private clinics and pharmacies in Hawassa town. The five facilities provide HIV care and services. HIV care and services at those facilities are provided by ART and PMTCT trained BSc midwives, nurses, health officers, doctors, and pharmacy technicians.

Study design, period, and population

Institution-based retrospective cross-sectional study was conducted from January 1, 2016-December 31, 2020. Data were retrieved from May 15-June 10, 2021. The source populations were all pregnant and lactating HIV positive women who were ever enrolled in ART at Hawassa public health facilities. The study population was all selected pregnant and lactating HIV positive women on ART from selected public health facilities who have lived at least for 6 months. Pregnant and lactating HIV positive women cards with incomplete data (date of HIV diagnosis, date of ART initiation, and outcome not recorded), and those who were start ART recently were excluded from this study.

Sample size determination and sampling technique

The sample size was determined by using a single population proportion in consideration of the following assumption: 95% confidence level, 5% margin of error, and the estimated proportion of retention in care at East Wollega, Oromia region was 74.8% [16]. Thus, $n_1 = z^2pq/d^2$. Then, $n_1 = (1.96)^2 (0.7485 \times 0.252) / (0.05)^2 = 290$. Given the source population ($N=675$) was finite and small, then $(n_1f) = 290/1 + 290/675 = 203$. By adding 10% missed records; total sample sizes of 223 were included. In Hawassa town, there are three governmental hospitals and 12 health centers. One comprehensive specialized hospital, one general hospital, and two health centers were selected out of fifteen health facilities by simple random sampling technique (lottery method). The calculated sample size (223) was proportionally allocated to the selected health facilities. Study participants' unique ART number was retrieved from the registration book and the number was used to find the PMTCT logbook, ART intake form, and medical cards and hence was used as a sampling frame. Then, within each health facility by using a simple random sampling technique, records of study participants were selected randomly by lottery method. Finally, 223 study participants' chart was reviewed and recorded on a tool.

Data collection method and tools

The data collection was administered by 3 Bsc midwife from a study setting who was not assigned at the ART clinic was recruited for data collection. One trained health officer and the principal investigator intensively supervised the data collection process. The data was collected by using a data abstraction form adapted from the federal ministry of health (FMOH),

PMTCT logbook, ART intake forms, and medical cards. Treatment adherence to ART and retention in care was assessed in three health facilities using retrospective records review. One cohort who started ART in all the 3 health facilities were traced from the health facility by retrospective record review to find out the loss to follow up within 5 years during the study period.

Data quality control

The data abstraction form was prepared in the English language. Data collectors and supervisors were trained for two days on data collection, objectives, data collection tools, record techniques and significance of the study, and checking the already filled abstraction form by the principal investigator. Pre-testing was performed at study areas to check consistency and any ambiguity of the abstraction form a week back of actual data collection and some of the deviation identified during pre-test was checked again and incorporated into the data abstraction form. Data completeness was checked by the supervisor daily and weekly by the principal investigator for completeness and missing values.

Study variables

Outcome variables: Retention in care and treatment Adherence.

Independent variables included: Socio-demographic characteristics of pregnant and lactating HIV patients (Age at start, marital status, level of education, residence, occupation of patient), Patient-related characteristics (time of ART initiated, gestation at booking, place of delivery, outcome of delivery, status of pregnancy at enrollment, partner HIV status, disclosure status), Baseline clinical and health service-related characteristics (Baseline functional status, baseline WHO clinical stage, baseline CD4 count, baseline ART regimen).

Operational definitions

Retention in care: all patients who are not recorded as deceased or lost to follow-up (LTFU) for any reason [26].

HIV patient retained in care: attending every 3 months scheduled clinic visit at month 6, 12, and 24 prior to data extraction to the ART at least 1 year from January 1, 2016-December 31, 2020 from the date enrolled.

HIV patient not retained in care: that had missed attending two or more successive scheduled visits at

month 6, 12, and 24 prior to data extraction to the ART clinic at least 1 year from the date enrolled.

Treatment adherence to ART: defined as “the extent to which a client follows a prescribed medication or treatment regimen” [10]. For this study treatment adherence was measured using recorded patient self-report (PSR) at 3, 6 or 12 months.

Good adherence: If a patient took $\geq 95\%$ of the expected doses of their ART a week within 3 months.

Poor adherence: If a patient took $< 95\%$ of the expected doses of their ART a week within 3 months.

Transfer out: included HIV patients who had officially moved to another facility by the health provider.

Lost to follow up (LTFU): Patients who had been receiving ART and had missed scheduled clinic or pharmacy appointments more than 3 months and were not known to have transferred out or died.

Data processing and analysis

The collected data was entered to EpiData V4.4.2.1 and then exported to Statistical Package for Social Science (SPSS) Version 23 for analysis. Data was coded and cleaned in SPSS V23. All required variables recording and computations were done before the main analysis. Descriptive analyses (mean, standard deviation, proportion) were conducted to obtain descriptive measures for the socio-demographic characteristics and other variables. Binary logistic regression was used to identify factors associated with retention in care and treatment adherence. The bi-variable logistic regression analysis started with unadjusted analysis in which each potential predictor

was assessed separately for its association with stunting [27]. Variables with p-values < 0.25 on the unadjusted analysis were entered into a multivariable logistic regression model to find out independent risk factors of stunting adjusting for other factors in the model.

Moreover, multicollinearity was checked by using the collinearity diagnostic test by checking the value of the Variance Inflation Factor (VIF) and tolerance test. Hosmer-Lemeshow goodness-of-fit was used to test for the model fitness, and the p-value for the Hosmer-Lemeshow test was 0.49 which indicates a good model. Odds ratio at 95% CI were used to measure the strength of association between outcome and predictor variables. P-value < 0.05 was considered to declare statistical significance in multivariate logistic regression analysis. Finally, the results were presented in texts, graphs, and tables.

Results

Socio-demographic characteristics of the pregnant and lactating HIV positive women

Two hundred twenty-three pregnant and lactating HIV patients were included in this study. The mean (\pm SD) age at start of ART was 26.7 (\pm 4.21) years with a minimum and maximum age of 15 and 38, respectively. About 62 (27.8%) belong to the age group of 25–29 years at start of ART and more than half, 144 (64.4%) were urban resident. The majority, 173 (77.6%) were married, and about 71 (31.8%) were unable to write and read. More than half, 115 (52.6%) were housewives (Table 1).

Table 1: Baseline socio-demographic characteristics of pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020 (n=223).

Variables	Categories	Number (%)
Age at start		
	15-19	30(13.5)
	20-24	57(25.6)
	25-29	62(27.8)
	30-34	52(23.3)
	≥ 35	22(9.9)
Residence		
	Urban	144(64.6)
	Rural	79(35.4)
Marital Status		
	Married	173(77.6)
	Single	27(12.1)
	Divorced	13(5.8)
	Widowed	10(4.5)

Education		
	Unable to read and write	71(31.8)
	Grade 1-8	58(26)
	Grade 9-12 and above	94(42.2)
Occupation		
	Housewife	115(51.6)
	Own work	47(21.1)
	Private employed	36(16.1)
	Government employed	17(7.6)
	Others*	8(3.6)

*: Daily laborer, Student

Patient related characteristics

One hundred thirty-five (60.5%) participants were initiated ART at PMTCT before pregnancy and about 78 (34.5%) had been linked to PMTCT at third trimester. At enrollment, more than half, 118(52.9%)

were pregnant, and most of, 211(94.6%) the delivery was live birth. Currently, more than half, 124(55.6%) patients were lactating. Two third, 144 (64.6%) of participants' partner HIV status were positive and majority, 180(80.7%) patients had disclosed HIV status to their partner (Table 2).

Table 2: Patient related characteristics of pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020 (n=223).

Variables	Categories	Number (%)
Time ART initiated at PMTCT		
	Before pregnancy	135(60.5)
	During pregnancy	47(21.1)
	During breast feeding	41(18.4)
Gestation at booking to PMTCT		
	First trimester	77(34.5)
	Second trimester	88(39.5)
	Third trimester	58(26)
Pregnancy status at enrollment		
	Pregnant	116(52)
	Lactating	107(48)
Delivery outcome		
	Live birth	211(94.6)
	Still birth	12(5.4)
Current status of the patient		
	Pregnant	76(34.1)
	Lactating	124(55.6)
	Not recorded	23(10.3)
Partner HIV status		
	Positive	144(64.6)
	Negative	35(15.7)
	Unknown	44(19.7)
HIV status disclosed to partner		
	Yes	180(80.7)
	No	43(19.3)

Baseline and current clinical and health service characteristics

At baseline, the majority, 150 (67.3%) of participants were in working functional status. One hundred forty-eight, 148 (66.4%) were in stage I or II WHO clinical stage category, and two third of patients, 135 (60.5%) had > 350 cells/mm³ CD4 count. More than half,

127 (57%) were on baseline triple ART regimen containing tenofovir, lamivudine, efavirenz (TDF/3TC/EFV). Currently, most of, 191 (85.5%) of participants were in working functional status. About 195 (87.4%) were in WHO stage I, and one hundred ninety-seven (88.3%) had > 350 cells/mm³ CD4 count. Two third, 146 (65.5%) were on triple ART

regimen containing tenofovir, lamivudine, dolutegravir (TDF- 3TC-DTG) (Table 3).

Table 3: Baseline and current clinical and health service characteristics of pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020 (n=223).

Variables	Categories	Number (%)
Baseline functional status		
	Working	150(67.3%)
	Ambulatory/bed ridden	73(32.7)
Baseline WHO Stage		
	Stage I/II	148(66.4)
	Stage III/IV	75(33.6)
Baseline CD4 level (cells/mm ³)		
	≤200	41(18.4)
	200-350	47(21.1)
	>350	135(60.5)
Baseline ART regimen		
	TDF-3TC-EFV	127(57)
	AZT-3TC-NVP	56(25.1)
	AZT-3TC-EFV	40(17.9)
Current functional status		
	Working	191(85.7)
	Not recorded	32(14.3)
Current WHO Stage		
	Stage I	195(87.4)
	Not recorded	28(12.6)
Current CD4 level (cells/mm ³)		
	≤200	10(4.5)
	200-350	12(5.4)
	>350	197(88.3)
	Not recorded	4(1.8)
Current ART regimen		
	TDF-3TC-DTG	146(65.5)
	TDF-3TC-EFV	42(18.8)
	AZT-3TC+EFV	22(9.9)
	Not recorded	13(5.8)

The level of retention in care among pregnant and lactating HIV patients

Of the 223 pregnant and lactating HIV patients had recorded, 3(1.3%) were died, 21(9.4%) were lost to follow up, 8(3.6%) were transferred to other health facility, and 191 (85.7%) (95% CI: 81%, 90%) were retained in the care during study period (Figure 1). The patient's record was reviewed for 24 months of

follow up with in study period. The HIV patients' retention in care at 6, 12 and 24 months was 52 per 1000 person-months, 48 per 1000 person-months and 31 per 1000 person-months respectively. Of the 21 lost to follow up patients, 4.1 per 1000 person-months, 5.5 per 1000 person-months and 4.8 per 1000 person-months were at 6, 12 and 24 months respectively.

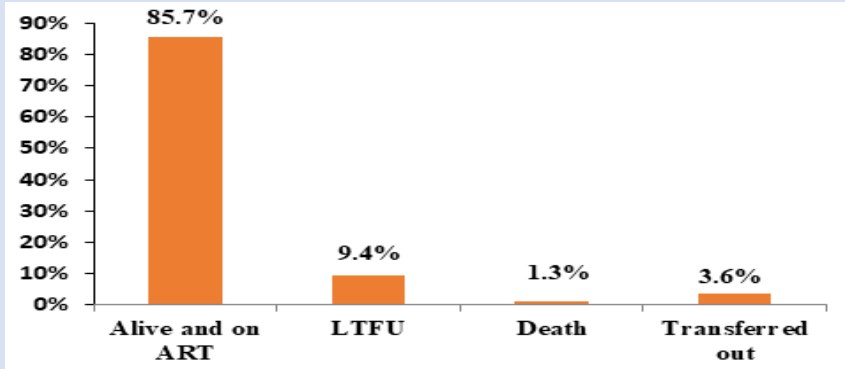


Figure 1: Maternal ART treatment outcome among pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020.

The patient's record was reviewed for 24 months of follow up with in study period. The HIV patients' retention in care at 6, 12 and 24 months was 52 per 1000 person-months, 48 per 1000 person-months and 31 per 1000 person-months respectively (Figure 2). Of

the 21 lost to follow up patients, 4.1 per 1000 person-months, 5.5 per 1000 person-months and 4.8 per 1000 person-months were at 6, 12 and 24 months respectively.

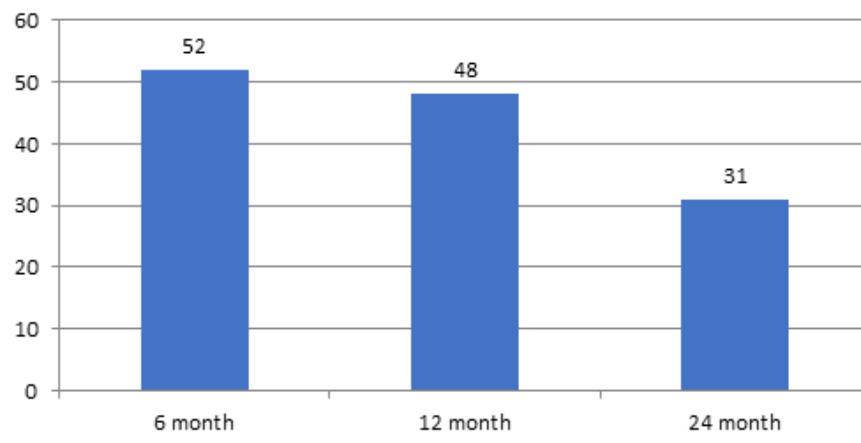


Figure 2: Trends of retention in care among pregnant and lactating HIV positive women.

Level of treatment adherence to ART

Treatment adherence to ART was measured by using records of patient self-report. Overall, of the 223 pregnant and lactating HIV patients, one hundred

ninety-seven (88.3%) (95% CI: 84%, 91.2%) had good adherence, 10 (4.5%) had fair adherence and 16 (7.2%) had poor adherence (Figure 3).

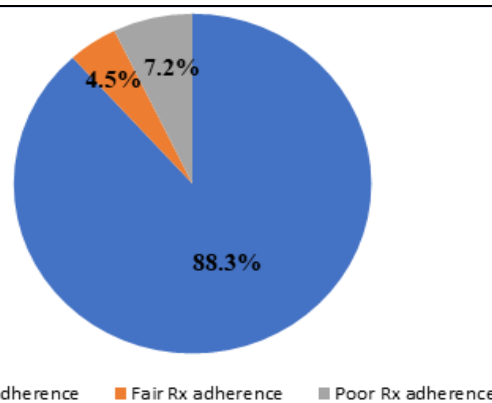


Figure 3: Percentage of treatment adherence level to ART among pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020.

Factors associated with retention in care to ART among pregnant and lactating HIV positive women

In the bivariate analysis, age at ART start, residence, educational status, time ART initiated at PMTCT, baseline functional status, baseline WHO stage, baseline CD4 level, partner HIV status, baseline and current ART regimen, and HIV status disclosed to their partner were important factors of retention in care to ART of pregnant and lactating HIV patients. The multivariable model revealed that educational status, baseline functional status and disclosure of HIV status had significant association with retention in care to ART among pregnant and lactating HIV

patients. The pregnant and lactating HIV patients who had secondary and above educational levels were 3.67 times [AOR = 3.67, 95%CI (1.18, 11.4)] more likely to retain in care of ART than mothers who were unable to write and read. This model also showed that those participants who had baseline working functional status were 4.5 times [AOR = 4.5, 95% CI (1.9, 10.82)] more likely to retain in care of ART than participants who had baseline ambulatory/bedridden functional status. Pregnant and lactating HIV patients who disclosed HIV status to their partner were 5.7 times [AOR = 5.7, 95% CI (2.25, 14.71)] more likely to retain in care to ART than those not disclosed (Table 4).

Table 4: Bivariable and Multivariable Logistic regression result on level and factors associated with retention in care among pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020 (n=223).

Variables	Categories	Retention		COR (95% CI)	AOR (95% CI)
		Retained No (%)	Not retained No (%)		
Age at start					
	15-19	23(76.7)	7(23.3)	1	1
	20-24	47 (82.5)	10(17.5)	1.43(0.48-4.24)	0.66(0.16 -2.73)
	25-29	57(91.9)	5(8.1)	3.47(0.99-12.1)	2.73(0.55 -13.45)
	30-34	46(88.5)	6(11.5)	2.33(0.7-7.74)	2.03(0.41 -10.16)
	>=35	18(81.8)	4(18.2)	1.37(.34-5.41)	0.99(0.16 - 6.09)
Residence					
	Urban	126(87.5)	18(12.5)	1.51(0.71-3.22)	2(0.73 - 5.47)
	Rural	65(82.3)	14(17.7)	1	1
Education					
	Unable to read and write	57(80.3)	14(19.7)	1	1
	Grade 1-8	46(79.3)	12(20.7)	0.94(0.40-2.23)	0.88(0.33-2.33)
	Grade 9-12 and above	88(93.6)	6(6.4)	3.60(1.31-9.92)	3.67(1.18- 11.4)*
Time ART initiated at PMTCT					
	Before pregnancy	118(87.4)	17(12.6)	1.95(0.79-4.79)	2.598(0.8- 8.35)
	During pregnancy	41(87.2)	6(12.8)	1.92(0.62-5.96)	3.018(0.7312.41)
	During breast feeding	32(78)	9(22)	1	1
Baseline functional status					
	Working	139(92.7)	11(7.3)	5.10(2.3011.31)	4.5(1.9- 10.82)*
	Ambulatory/bedridden	52(71.2)	21(28.8)	1	1
Baseline WHO stage					
	Stage I/II	130(87.8)	18(12.2)	1.66(0.77-3.55)	1.2(0.44- 3.24)
	Stage III/IV	61(81.3)	14(18.7)	1	1
Baseline CD4 level(cells/mm3)					
	<=200	30(73.2)	11(26.8)	0.42(0.18-0.98)	0.56(0.21- 1.48)
	201-350	44(93.6)	3(6.4)	2.26(0.63-8.04)	3.49(0.83-14.71)
	>350	117(86.7)	18(13.3)	1	1
Partner HIV status					
	Positive	133(92.4)	11(7.6)	.29(0.83- 6.31)	2.38(0.76,7.48)
	Negative	21(60)	14(40)	0.28(0.10-0.81)	0.31(0.09,1.05)

	Unknown	37(84.1)	7(15.9)	1	1
Baseline ART regimen					
	TDF-3TC-EFV	109(85.8)	18(14.2)	0.49(0.14-1.76)	0.49(0.12- 2.05)
	AZT-3TC-NVP	45(80.4)	11(19.6)	0.33(0.08-1.28)	0.28(0.06- 1.23)
	AZT-3TC-EFV	37(92.5)	3(17.5)	1	1
Current ART regimen					
	TDF-3TC-DTG	147(98)	3(2)	2.3(0.23-22.85)	0.5(0.02-11.89)
	TDF-3TC-EFV	24(61.5)	15(38.5)	0.9(0.1- 0.7)	0.13(0.001-1.33)
	AZT-3TC-EFV	20(95.2)	1(4.8)	1	1
HIV status disclosed to partner					
	Yes	163(90.6)	17(9.4)	5.14(2.3-11.45)	5.7(2.25- 14.71) *
	No	28(65.1)	15(34.9)	1	1

*Indicates variables significant at P-value <0.05; 1: Indicates reference category

Factors associated with treatment adherence to ART among pregnant and lactating HIV positive women

In the bivariate analysis, showed that age at ART start, residence, educational status, time ART initiated at PMTCT, baseline WHO stage, baseline CD4 level, baseline and current ART regimen and HIV status disclosed to their partner were important factors of treatment adherence to ART of pregnant and

lactating HIV patients. The multivariable model revealed that baseline WHO stage had significant association with treatment adherence to ART among pregnant and lactating HIV patients. Pregnant and lactating HIV patients who had baseline WHO stage I/II were 2.5 times [AOR = 2.5, 95% CI: (1.04, 5.99)] more likely adhere to ART treatment than those who had baseline WHO stage III/IV (Table 5).

Table 5: Bivariable and Multivariable Logistic regression result on level and factors associated with treatment adherence to ART among pregnant and lactating HIV positive women at public health facilities of Hawassa, Sidama, Ethiopia, January 1, 2016-December 31, 2020 (n=223).

Variables	Rx adherence to ART		COR (95% CI)	AOR (95% CI)
	Good N ₀ (%)	PoorN ₀ (%)		
Age at start				
15-19	24(80)	6(20)	1	1
20-24	51(89.5)	6(10.5)	2.12(0.62,7.28)	1.5(0.35,6.07)
25-29	58(93.5)	4(6.5)	3.62(0.94,14.01)	3.72(0.73,18.85)
30-34	44(84.6)	8(15.4)	1.37(0.43,4.43)	1.12(0.26,4.75)
>=35	20(90.9)	2(9.1)	2.5(0.45,13.78)	1.59(0.22,11.66)
Residence				
Urban	132(91.7)	12(8.3)	2.37(1.04,5.41)	2.19(0.92,5.22)
Rural	65(82.3)	14(17.7)	1	1
Education				
Unable to read and write	62(87.3)	9(12.7)	1	1
Grade 1-8	49(84.5)	9(15.5)	0.79(0.29,2.14)	0.75(0.24,2.38)
Grade 9-12 and above	86(91.5)	8(8.5)	1.56(0.57,4.27)	1.42(0.44,4.56)
Time ART Initiated at PMTCT				
Before pregnancy	123(91.1)	12(8.9)	1.42(0.47,4.31)	1.4(0.4,4.95)
During pregnancy	38(80.9)	9(19.1)	0.58(0.18,1.92)	0.67(0.17,2.6)
During breast feeding	36(87.8)	5(12.2)	1	1
Baseline WHO Stage				
Stage I/II	137(92.6)	11(7.4)	3.11(1.35,7.18)	2.5(1.04,5.99) *
Stage III/IV	60(80)	15(20)	1	1
Baseline CD4 level(cells/mm³)				
<=200	36(87.8)	5(12.2)	0.7(0.23,2.13)	0.83(0.24,2.9)
201-350	38(80.9)	9(19.1)	0.41(0.16,1.05)	0.35(0.12,1.03)
>350	123(91.1)	12(8.9)	1	1

Baseline ART regimen				
TDF-3TC-EFV	119(93.7)	8(6.3)	3.16(1.07,9.34)	2.96(0.97,9.03)
AZT-3TC-NVP	45(80.4)	11(19.6)	0.87(0.30,2.48)	0.95(0.32,2.85)
AZT-3TC-EFV	33(82.5)	7(17.5)	1	1
Current ART regimen				
TDF-3TC-EFV	134(91.8)	12(8.2)	3.28(1.03,10.6)	4(0.98,17.14)
AZT-3TC-NVP	36(85.7)	6(14.3)	1.76(0.47,6.6)	2.6(0.48,14.2)
AZT-3TC-EFV	17(77.3)	5(22.7)	1	1
HIV status disclosed to partner				
Yes	163(90.6)	17(9.4)	2.54(1.04,6.17)	2.38(0.92,6.14)
No	34(79.1)	9(20.9)	1	1

*: Indicates variables significant at P-value <0.05; 1: Indicates reference category.

Discussion

The overall level of retention in care to ART was 85.7%, (95% CI: 81%, 90%) in this study. This finding was consistent with other studies conducted in Gondar 88.2% and Uganda 87.9% [28,29]. However, the level of retention in care of this study was higher than the studies conducted in Ethiopia systemic review and meta-analysis (70.65%), Northern Ethiopia (70%), and Malawi (42%) [14, 16,30]. The reason for this difference might be study design, study setting, and study population. Study in Ethiopia systemic review and meta-analysis and Northern Ethiopia were among adults living with HIV/AIDS. This difference in Malawi might be due to the setting and time at which studies were conducted. In contrast, the level of retention in care of this finding was lower than the previous studies done in Cape Town South Africa 94% [31]. The reason for this difference might be countries have different socio-demographic characteristics, levels of infrastructure and HIV burden that could cause patients not to be retain in care and transfer out [32].

In this study, the educational status of women showed a statistically significant association with retention in care to ART. Pregnant and lactating HIV patients who had secondary and above education level were more likely to retain in care than mothers who were unable to write and read. This finding was consistent with previous studies conducted in East Wollega, a systematic review in low and middle-income countries, and Uganda [16,33,34]. This was explained as better access to information and self-decision making about care might be high for the women with a higher educational status that helps to retain in HIV care. According to the report of this study, baseline working functional status was significantly associated with factors of retention in care in the current study. Pregnant and lactating HIV patients who had baseline working functional status were more likely to retain in care than those who had baseline

ambulatory/bedridden functional status. This finding was consistent with previous studies conducted in Ethiopia [35-38], and Zimbabwe [39]. The possible reason for this could be their ability to do their routine activity including their daily work and visit health facilities regularly [40, 41].

This study also showed that disclosure of the HIV status to their partner was significantly associated with retention in care to ART in this study. Pregnant and lactating HIV patients who disclosed their HIV status were more likely to retain in care than those who did not disclose their HIV status to their partner. This finding was consistent with previous studies conducted in East Wollega[16], Sub-Saharan Africa[33], Malawi [30], and Uganda [34]. This is due to disclosure of HIV status might help to predict and prevent inconsistent care and to have family support. Existed evidence reported as non-disclosure was associated with poor retention in care [42]. The overall level of treatment adherence to ART among pregnant and lactating HIV positive women was 88.3%, (95% CI: 84%, 91.2%) according to this study. This finding was in line with other studies conducted in Tigray Region of North Ethiopia 87.1% [18], Yirgalem Hospital, South Ethiopia 88.7% [43], South wollo Zone 87.9% [17], Kisumu Kenya 84% [44], Nigeria 89.2% [45], and Malawi 91% [46]. However, the treatment adherence level of this study was higher than the studies conducted in Southern Ethiopia 81.4% [47], Hadya Zone 83.7% [19], East Shewa Zone 82.6% [48], and Sobi Specialist Hospital, Nigeria 73.3% [39]. The reason for this discrepancy might be the study population. The studies conducted in Sobi Specialist Hospital, Ilorin, Nigeria was among the general population. Other studies conducted in Hadya Zone, East Shewa Zone, and Southern Ethiopia were only among pregnant women. Pregnant and lactating women want to have HIV-free children and have challenges like caring for their families and

children than general people living with HIV/AIDS (PLHIV).

In contrast to this finding, the level of adherence was lower than a study done in Ayder referral hospital, Northern Ethiopia (95.1%) among HIV-positive pregnant women [50]. The reason for this difference might be the discrepancy in sample size and the setting in which the research was done. The sample size study at Ayder referral hospital was among forty-one HIV-positive pregnant women and it was only in one public health facility. In this study, the WHO stage of HIV/AIDS at ART initiation was a significantly associated factor with treatment adherence to ART. Pregnant and lactating HIV patients who had started the ART treatment when their WHO clinical stage I/II were more likely had a good adherence than those who had started the ART treatment when their stage III/IVs. This finding was consistent with previous studies conducted in different countries [16, 51]. The potential reason for this is, patients with advanced WHO stage could have an increased pill burden during treatment of opportunistic infections, significant weakness in attending clinic appointments, and that may create more challenges to memorize recommended ART treatment.

Limitation of the study

The strength of the study, the study tried to assess retention in care and treatment adherence to ART for pregnant and lactating HIV-positive women together and provide important insight on prevalence and associated factors. Regardless of its strengths, our study had some basic limitations that might be considered while interpreting the results. First, since the data was based on recorded patients' chart, this was difficult to know the status of self-referred and transferred out pregnant and lactating HIV positive women. This may lead to over or underestimation of outcome interest. Second, this study only analyses maternal outcomes and we did not review data on baby outcomes, and therefore we do not have information about the mother-baby. Third, the generalizability of this study finding may be limited to the public health facilities of Hawassa. Moreover, due to a cross-sectional study, it was difficult to identify the causal-effect relationships.

Conclusions

The level of retention in care in the current study was suboptimal compared to the national target. Secondary and above education level, baseline working functional status, and HIV status disclosures were important associated factors with retention in care. In addition to this, the level of retention in care in the current study was suboptimal compared to the national target Baseline WHO stage was an important associated factor with treatment adherence.

Therefore, Hawassa comprehensive specialized hospital and city administration health department should enhance retention in care for HIV patients who were unable to read and write. Facility management should try to develop strategies on having better access to information and encouraging self-decision making. In addition, existing Information, Education and Communication (IEC) interventions on HIV/AIDS should be strengthened in order to improve HIV disclosure. Health professionals shall counsel and encourage HIV patients to disclose their HIV status to partners. Moreover, pregnant and lactating HIV patient should be advised on the importance of retention in care and adherence to antiretroviral therapy.

Abbreviations

AIDS: Acquired Human Immune Disease Syndrome; ARV: Antiretroviral; AZT: Zidovudin; EFV: Efavirenz; NVP: Nevirapin; PLHIV: People Living with Human Immune- deficiency Virus; SPSS: Statistical Package for Social Science; TDF: Tenofovir; UNAIDS: United Nation Acquired Human Immune Disease Syndrome.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board (IRB) at the College of Medicine and Health Sciences of Hawassa University before commencing data collection (Ref. No: IRB/145/13). An official letter of permission was obtained from the Department of Public Health to the respective district health office. Informed written permission was also obtained from the district health office. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

All authors declare that they have no conflicts of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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Authors' contributions

TD- Involved in initiation of the research question, prepared the research proposal, carried out the research, did the data entry and analysis, and wrote the manuscript. TL- conducted edition, advising, cooperatively prepared research tools with PI, and revised the manuscript. FT- conducted edition, advising, and reviewed the manuscript. TT- Did the data entry, analysis, prepared and reviewed the manuscript. All authors have read and approved the final manuscript.

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