Adherence to antiretroviral therapy and associated factors among human immunodeficiency -positive patients accessing treatment at health centers in East Gojjam Zone, Northwest Ethiopia, 2019: Community-based cross-sectional study

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ABSTRACT

Background: To achieve an effective treatment outcome, Antiretroviral Therapy (ART) for people living with the Human immunodeficiency virus (HIV) needs at least a 95% adherence level. The aim was to assess adherence to antiretroviral therapy and its associated factors among patients accessing treatment at Health centers in East Gojjam Zone, Northwest Ethiopia.

Methods: A community-based cross-sectional study was conducted on 770 HIV-positive patients from April 1 to May 10, 2019, in East Gojjam Zone. The study participants were selected by simple random computerized sampling methods. Primary data was collected from the patients through face-to-face interviews and home-to-home visits. Bivariable and multivariable binary logistic regression analyses were done. Independent variables with a P-value of <0.2 in bivariable binary logistic regression analysis were considered for multivariable binary logistic regression analysis. A P-value of <0.05 was used as the cut-off point for the presence of statistical significance.

Results: About 396 (51.8%) of the study participants had good adherence. Being 18–24 years old [Adjusted Odd Ratio (AOR) = 0.43; 95% CI = 0.21–0.86], having a marital status of being widowed (AOR = 0.29; 95% CI = 0.14–0.58), having a disease duration of >10 years (AOR = 0.47; 95% CI = 0.24–0.94), taking a drug regimen of Tenofovir (TDF) + Lamivudine (3 TC) + Nevirapine (NVP) (AOR = 2.94; 95% CI = 1.406.15), not being socially stigmatized (AOR = 0.52; 95% CI = 0.34–0.78), and having not encountered an opportunistic infection (AOR = 3.91; 95% CI = 2.68–5.72) were significant factors.

Conclusions: The level of adherence was low. Opportunistic infection prevention, reduction of social stigma, and other intervention activities should be strengthened to increase the level of adherence.

1. Introduction

Human immunodeficiency virus (HIV) is one of the principal causes of morbidity and mortality worldwide [1]. Since 1981, seventy-eight million people have become infected, and 39 million people have died from acquired immunodeficiency syndrome

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(AIDS) related illnesses [2]. Globally, 36.9 million people were living with human HIV, 1.8 million new infections [3–6], and 940,000 died from HIV-related causes in 2017 [3,4]. Sub-Saharan Africa contributed to 73% of all living with HIV, 76% of the total new HIV infections, and 75% of the total HIV/AIDS-related deaths [7]. In Ethiopia, 718,550 people were living with this virus, 30,000 new infections [8], and 19,743 deaths every year [9].

Globally, Antiretroviral therapy (ART) was started in 1996 [10]. In Ethiopia, the ART program was introduced in 2003 [11]. The risk of HIV transmission to others was reduced by up to 96% by Antiretroviral therapy [2]. Before initiating ART, comprehensive discussions with all clients about their willingness and readiness to initiate ART, ART regimen, dosage and schedule, the likely benefits and possible adverse effects, and the required follow-up and monitoring visits [12]. Globally, 21.7 million people were getting ART in 2017 [3–5]. In Ethiopia, 426,000 people are now taking ART [12]. In the period spanning from 2000 to 2017, the world witnessed a decline of 36% in the number of new HIV infections and a 38% decrease in HIV-related deaths, owing to the use of ART [3].

Adherence is the degree to which a person's behavior–taking medications, following a diet, and/or doing lifestyle changes parallels with agreed recommendations from the health workers [13]. The World health organization (WHO) has put forth a recommendation stipulating that for individuals living with HIV, the adherence rate for antiretroviral therapy (ART) should reach a minimum of 95% to achieve complete viral suppression. This means that people with HIV must follow the prescribed ART regimen as closely as possible and take their medications as directed by healthcare professionals. Adherence rates lower than 95% may result in incomplete viral suppression, which can increase the risk of disease progression and transmission to others. The WHO's guideline underscores the significance of strict Adherence to ART to maximize treatment effectiveness and improve the overall health of individuals living with HIV. Therefore, healthcare providers and public health organizations encourage regular monitoring and support for Adherence to ART as an integral component of HIV care [14].

Being non-adherent to ART drugs causes high serum viral load, and drug resistance [15,16], reduces the immunological benefit of treatment [17], and increases AIDS-related hospitalizations, illness, and death [15,18–20]. Even though the accelerated scale-up of access to ART has led to a decline in HIV-related illness, death, and new HIV infections [21], the trend of ART non-adherent is increasing in Ethiopia [22]. The main aim of this study was to assess the level of Adherence to antiretroviral therapy and its associated factors among Human immunodeficiency virus positive patients accessing treatment at Health centers in East Gojjam Zone. Previous studies were primarily focused on patients who came to the health facility for drug refills, but the current study incorporated community-based pill counts.

2. Methods

2.1. Study design and study period

Community-based cross-sectional study was conducted from April 1 to May 10/2019 in East Gojjam Zone. East Gojjam is bordered on the South by the Oromia Region, on the West-by- West Gojjam, on the North by South Gondar, and the East by South Wollo; the bend of the Abay River defines the Zone's Northern, Eastern and Southern boundaries. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 2,719,119 of whom 1,386,751 (51%) are female. The Zone has 1 referral hospital, 11 primary hospitals, and 102 health centers. Of the total health centers, 23 health centers provide antiretroviral drug therapy [23].

2.2. Sample size determination and sampling technique

Using single population proportion formula of $(n = [(Z\alpha/2)^2 \times P (1 - P)]/S^2)$ with a 95% confidence interval and 0.05 margin of error (S), the sample size for the study was calculated to be 350, based on an adherence level of 65% from a previous study conducted in Dire Dewa, Ethiopia [24]. To account for a design effect of 2 and a 10% non-response rate, the calculated sample size was multiplied by two and increased to 770. To recruit study participants, a multi-stage sampling method was employed. First, eight health centers were chosen at random from a total of 23 health centers, after which the sample size was proportionally assigned to each of the eight health centers. Finally, study participants were selected from these eight health centers using a simple random computerized sampling method with unique ART numbers used as the sampling frame.

2.3. Measurement and data collection procedure

A structured questionnaire and checklist were developed based on a review of relevant literatures. Unique ART numbers/patient record numbers were utilized as identifiers to link patients with their medical records. Patients' addresses were obtained from health centers, and primary data were collected through face-to-face interviews conducted by HIV-positive community health workers who had completed grade ten or above in education level (In addition to health workers, HIV-positive voluntary community health workers are working as ART defaulter tracers in Ethiopia). Home visits were conducted to collect this data. If the study participants were aged less than 18 years, primary data were collected from the patients and their respective /. In addition, secondary data were extracted from the medical records of selected ART patients. The adherence to ART (i.e., Individual followed the advice given by healthcare providers concerning taking medication) was a dependent variable and was determined by combining self-reported adherence and pill count data. The adherence rate was calculated by dividing the number of pills taken within one month by the patient by the number of pills the patient was supposed to take within one month, then multiplying the resultby100. Independent variables included socio-demographic factors (such as sex, age, marital status, residence, occupation, Educational level, and monthly income), clinical factors

(such as HIV stage, ARV drug used, CD4 count, opportunistic infection, side effects, and duration of disease), psychosocial factors (such as disclosure status, social support, depression, perceived social stigma and Adherence counseling), and behavioral (such as Current substance use/Frequent use of alcohol, Khat or cigarette). Depression was measured using the nine-item Patient Health Questionnaire (PHQ-9). Greater or equal to 5 was used as cut-off score point of PHQ-9 for depressive symptoms [25]. The perceived social stigma was assessed using ten questions with 'yes' or 'no' response choices. Perceived stigma was defined by having at least 1 yes answer out of the 10 questions [26].

2.4. Data quality control

Data collectors and supervisors received two days of training on data collection processes, and a pre-test was conducted to ensure the understandability of the data collection tool. The collected data were checked for consistency and completeness daily by eight trained supervisors. To facilitate data collection, the questionnaire was translated into Amharic and then translated back into English to ensure consistency. Furthermore, before data entry, the data were checked for completeness. To ensure data quality, the data were double-entered into Epidata version 3.1.

2.5. Data Processing and Analysis

Collected data were coded and entered into Epi data version 3.1, and then it was exported to the statistical package for social science (SPSS) version 23 for analysis. Descriptive, Bi-variable, and multi-variable binary logistic regression analysis was done. Tables and text were used to present the result of the analyzed data. Independent variables with a P-value of <0.2 in Bi-variable binary logistic regression analysis were considered for Multivariable binary logistic regression analysis. P-value < 0.05 was used as cut-off point for the presence of statistical significance. The final Multivariable model was tested for goodness of fit with the HosmerLemeshow test.

3. Results

3.1. Socio-demographic of Participants

The study involved 765 participants with a 99.4% response rate. Out of the total participants, 405 (53.1%) were male. The median age of the study participants was 35 years with an interquartile range (IQR) [the difference between quartile (Q3) and quartile (Q1)] of 17 years, and almost one-third, 265 (34.6%) of study participants lie in the age group between 25 and 34 years. Regarding marital status, 463 (60.5%) of the study participants were married. About 274 (35.5%) of participants have a primary educational level. Nearly one-third, 237 (31.0%) of study participants were farmers, and more than half, 428 (55.9%) of participants were urban dwellers. The

Table 1
Socio-demographic characteristics of HIV-positive patients accessing ART at Health centers in East Gojjam Zone, Northwest Ethiopia, 2019.

Variables		Frequency	Percentages
Sex	Male	359	46.9
	Female	406	53.1
Age in Year	18–24	98	12.8
	25–34	265	34.6
	35–44	201	26.3
	>44	201	26.3
Marital status	Married	463	60.5
	Single	107	14.0
	Divorced	113	14.8
	Widowed	82	10.7
Educational level	No formal education	221	28.9
	Primary	274	35.8
	Secondary	194	25.4
	College and above	76	9.9
Occupation	Daily Laborer	124	16.2
	Farmer	237	31.0
	Merchant	173	22.6
	House wife	114	14.9
	Government Employee	83	10.8
	Others	34	4.4
Residence	Urban	428	55.9
	Rural	337	44.1
Monthly income	Lowest income	154	20.1
	2nd quintile	166	21.7
	3rd quintile	155	20.3
	4th quintile	151	19.7
	Highest income	139	18.2

median monthly income was 4500 Birr [IQR = 3300 Birr]. Additionally, 155 (20.3%) of participants had a monthly income in the third quintile (4201–5400 birr) (Table 1).

3.2. Clinical and behavioral characteristics of participants

Out of the 765 study participants, 293 (38.3%) were in stage II. The drug regimen of TDF+3 TC + EFV was taken by 286 (37.4%) of the participants. The median of most recent CD4 count was 432 cells with IQR = 387 cells. Three hundred fifteen (41.2%) had most recent CD4 count between 200 and 500 cells. More than half, 415 (54.2%) of study participants were encountered with history of opportunistic infections (OIs), while 423 (55.3%) had not experienced any side effects. Almost half, 376 (49.2%) of study participants had been living with HIV for 1–5 years. Nearly three-fifth, 463 (60.5%) of study participants had disclosed their HIV status to their family, 412 (53.9%) had family/social support. More than half, 419 (54.8%) of study participants had no history of depression, and, 447 (58.4%) had not experienced social stigma related to HIV. Furthermore, 427 (55.8%) had no history of substance use, and almost three-fifth, 461 (60.3%) of study participants had received adherence counseling (Table 2).

3.3. Level of adherence

Out of the study participants, 12 (1.6%) had an, adherence rate of less than 70%, 17 (2.2%) had an adherence rate of 70–79.99%, 164 (21.4%) had an adherence rate of 80–89.99%, 176 (23%) had an adherence rate of 90–94.99%, and 396 (51.8%) with 95% a CI of 48.5%–55.4% had a good adherence rate of 95% or higher.

3.4. Factors

Patients aged 18–24 years were 57% less likely to be adherent than those in the older age group (>44 years). Widowed patients were 51% less likely to be adherent than married patients. Patients with a disease duration greater than ten years were 53% less likely to be adherent than those with a disease duration of less than one year. Patients taking TDF+3 TC + NVP were 2.94 times (AOR = 2.94; 95% CI = 1.40–6.15) more likely to be adherent compared to those taking the AZT+3 TC + NVP regimen. Patients who did not face social stigma were 48% less likely to be adherent compared to those who faced social stigma. Patients without a history of opportunistic infection were 3.9 times (AOR = 3.91; 95% CI = 2.68–5.72) more likely to be adherent compared to those with opportunistic

Table 2
Clinical and Behavioral characteristics of HIV positive patients accessing ART at Health centers in East Gojjam Zone, Northwest Ethiopia, 2019.

Variables		Frequency	Percentages
Most recent HIV stage	Stage I	278	36.3
	Stage II	293	38.3
	Stage III	173	22.6
	Stage IV	21	2.7
ARV drug used	TDF+3 TC + EFV	286	37.4
	AZT+3 TC + EFV	229	29.9
	AZT+3 TC + NVP	99	12.9
	TDF+3 TC + NVP	90	11.8
	ABC+3 TC + EFV	61	8.0
Most recent CD4 Cell count	<200	116	15.2
	200–500	315	41.2
	501–800	240	31.4
	>800	94	12.3
History of opportunistic infections (OIs)	Yes	415	54.2
	No	350	45.8
Experienced side effects	Yes	342	44.7
	No	423	55.3
Duration of Disease	<1 Year	80	10.5
	1–5 Year	376	49.2
	6–10 Year	241	31.5
	>10 Year	68	8.9
Family disclosure status	Yes	463	60.5
	No	302	39.5
Family/social support	Yes	412	53.9
	No	353	46.1
Depressed	Yes	346	45.2
	No	419	54.8
Perceived social stigma	Yes	318	41.6
	No	447	58.4
Current substance use	Yes	338	44.2
	No	427	55.8
Adherence counseling	Yes	461	60.3
	No	304	39.7

infection (Table 3).

4. . Discussion

The primary aim of this study was to measure the degree of adherence to ART and determine its predictors among Adult HIV-positive patients. Accordingly, the prevalence of good adherence was found to be 51.8% (95% CI = 48.5%–55.9%). This is lower than the rates reported in previous studies conducted in Eastern Ethiopia, which were 85% and 65% [24,27], Northwest Ethiopia 88.2% [28], North-Eastern Ethiopia 71.8% [29], Northern Ethiopia 74.6% [30], South Western Ethiopia 83.3% [31], Nekemte Specialized Hospital, Oromia, Ethiopia 81% [32], Indonesia 84.16% [33], Soweto, South Africa 88% [34] and Uganda 90.4%. The findings could be attributed to variations in the data collection methods. The prior studies were conducted on patients who visited the health care center for medication refill or relied on self-report data. In contrast, this study utilized a community-based pills count method, which encompassed all individuals with HIV, including those who do not attend clinics regularly.

The finding of this study is consistent with the study conducted in Benishangul-Gumuz, Ethiopia 54.3% [35], West Java Province, Indonesia 55.7% [36], The study found that patients aged 18–24 years were 57% less likely to adhere to ART than those aged >44 years, consistent with a study conducted in South Western Ethiopia [31]. One possible explanation for this finding is substance abuse among younger patients, which can lead to non-adherence. Additionally, younger patients may fear stigma and discrimination, as they are often dependent on others.

Widowed patients were 71% less likely to adhere to ART than those who were married. This might be due to Living alone and a lack of support have been linked with non-adherence to ART (35).

Patients whose disease duration was ten years and above were 53% less likely to adhere with ART as compared with patients whose

Table 3
Bivariable and Multivariable logistic regression analysis of factors associated with adherence among HIV/AIDS positive patients accessing ART at Health centers in East Gojjam Zone, Northwest Ethiopia, 2019.

Variables	Adherent	Not Adherent	COR (95%) CI	P-value	AOR (95%) CI	P-value
Age in Year						
18–24	51	47	0.53 (0.32–0.87)	0.000	0.43 (0.21–0.86)	0.017
25–34	132	133	0.49 (0.33–0.71)	0.012	0.18 (0.11–0.31)	0.000
35–44	78	123	0.31 (0.21–0.47)	0.000	0.17 (0.10–0.30)	0.000
>44	135	66	1		1	
Marital status						
Married	262	201	1		1	
Single	45	62	0.55 (0.36–0.85)	0.004	0.47 (0.27–0.81)	0.006
Divorced	57	56	0.78 (0.52–1.18)	0.007	0.76 (0.44–1.29)	0.307
Widowed	32	50	0.49 (0.30–0.79)	0.039	0.29 (0.14–0.58)	0.001
Family disclosure status						
Yes	228	235	1		1	
No	168	134	1.29 (0.97–1.73)	0.084	1.53 (1.04–2.24)	0.029
Disease duration						
<1 Year	48	32	1		1	
1–5 Year	179	197	0.61 (0.37–0.99)	0.027	0.64 (0.29–1.48)	0.017
6–10 Year	125	116	0.72 (0.43–1.20)	0.045	0.39 (0.20–0.76)	0.000
>10 Year	44	24	1.22 (0.63–2.39)	0.107	0.47 (0.24–0.94)	0.000
Depression						
Yes	193	153	1.34 (1.01–1.79)	0.044	1.12 (0.76–1.65)	0.551
No	203	216	1		1	
ARV drug used						
AZT+3 TC + NVP	36	63	1		1	
AZT+3 TC + EFV	100	129	1.36 (0.83–2.20)	0.118	0.82 (0.45–1.50)	0.520
TDF+3 TC + EFV	183	103	3.11 (1.93–5.00)	0.000	2.59 (1.46–4.61)	0.001
TDF+3 TC + NVP	57	33	3.02 (1.67–5.47)	0.000	2.94 (1.40–6.15)	0.004
ABC+3 TC + EFV	20	41	0.85 (0.43–1.67)	0.064	1.02 (0.44–2.37)	0.967
Experienced side effects						
Yes	155	187	1		1	
No	241	182	1.60 (1.20–2.13)	0.001	1.57 (1.04–2.35)	0.030
Perceived social stigma						
Yes	201	246	1		1	
No	195	123	0.51 (0.38–0.69)	0.000	0.52 (0.34–0.78)	0.001
Family/social support						
Yes	232	180	1.48 (1.12–1.98)	0.007	0.96 (0.65–1.42)	0.838
No	164	189	1		1	
Opportunistic infections (OIs)						
Yes	149	266	1		1	
No	247	103	4.28 (3.15–5.81)	0.000	3.91 (2.68–5.72)	0.000
Adherence counseling						
Yes	254	207	1.40 (1.05–1.87)	0.023	1.73 (1.12–2.68)	0.014
No	162	142	1		1	

disease duration was <1 year. This is consistent with the studies conducted in Turkish university hospital and a Tertiary Hospital in Ilorin, Nigeria [37–39]. This might be the reduction of immunity. As the duration of disease increase the immunity of the patient reduce, which may lead to opportunistic infection. This might impose non adherence.

Patients who have not encountered opportunistic infection were almost 4 times more likely to adhere than those who have an opportunistic infection. This is consistent with the study conducted in Eastern Ethiopia [27] and Benishangul-Gumuz Regional State, Ethiopia [35]. This might be due to the pills' burden or being bedridden. The patient who had an opportunistic infection was forced to take other drugs. This might lead to pills burden which imposed non-adherence or a patient who had opportunistic infection might to lead bedridden which might force them to discontinue taking ART drugs. Those patients taking less pill burden were more likely adherent [40]. This might show that multiple occurrences of the infections potentially increase the pill burden which can be associated with increased of adverse that influence treatment adherence.

Patients who had been taking TDF+3 TC + NVP were 3 times (AOR = 2.94; 95% CI = 1.40–6.15) more likely adherent than those patients who had been taking the regimen of AZT+3 TC + NVP. This is almost similar to the study conducted in Indonesia [33]. This might be due to the side effect. In addition, it might be due to toxicity. TDF-containing regimens are less toxic than AZT-containing regimen [41].

Patients who had not been faced with social stigma were 48% times less likely adherent than those patients who had been faced with social stigma. This is consistent with the study conducted in Soweto, South Africa [34]. Social isolation is a predictor of non-adherence [42] because stigmatized patients do not want to be seen taking their drugs.

4.1. . Strengths and limitations of the study

Previous studies mainly focused on patients who came for regular drug fills, and primary data were only self-report, but this study incorporated patients who have no regular visits, and combined pills count and self-report. The finding of this study should be interpreted with some limitations. The intervals between doses and dietary instruction could not be observed in this study. Inaccuracy results could be happening when patients take out pills from their bottles without swallowing them ("pill dumping"). To avoid disclosure issues, data collectors were selected from the same district where the study participants were living. This could create information bias.

5. . Conclusion

In summary, adherence to ART among the study population was found to be below the recommended level. Several factors, such as being between 18 and 24 years old, being widowed, having a disease duration of more than ten years, not being stigmatized, and not encountering with opportunistic infection were identified as significant determinants of adherence. Therefore, based on the findings, it is recommended that interventions be implemented to increase adherence to ART among the study population. The interventions should address the identified determinants, such as opportunistic infection prevention, reducing social stigma, and other similar activities. In particular, strategies to improve adherence should target the subgroups identified as being at higher risk, including those between 18 and 24 years old, those who are widowed, those with disease duration greater than ten years, those who are stigmatized, and those who have experienced opportunistic infections. Additionally, healthcare providers should prioritize monitoring and supporting patients in these subgroups to ensure that they adhere to ART and maintain optimal health outcomes.

5.1. Institutional review board and permission letter statement

The Institutional Review Board of Bahir Dar University Medicine and Health Science College gave its approval to the study, which was carried out in accordance with the Declaration of Helsinki's principles (protocol code IRB/MHSC/018/2019 approved on March 17, 2019). A permission letter was pursued from the East Gojjame Zone health department.

5.2. Informed consent and confidentiality statement

Informed written consent was got from patients or from the parents or caregivers of participants who were under 18 years of age. The information collected from the study participant was maintained its confidentiality by not writing the names of the study participants on the questionnaire paper.

Author contribution statement

Mengistie Kassahun Tariku: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Daniel Tarekegn Worede: Analyzed and interpreted the data; Wrote the paper.

Abebe Habtamu Belete: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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