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ORIGINAL RESEARCH

Quality of Life and Associated Factors of HIV Patients Under Treatment with First Line Regimens in Public Hospitals in Amhara Region, North-West Ethiopia

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Background: The availability of medication related to HIV treatment in the world is one of the substantial improvements for reaching USAID's 90-90 targets. Among the 90% of patients who have awareness about their disease, 90% are accessing their treatment and patients who received appropriate treatment have a suppressed viral load and improved CD4 cell count. Therefore, the main objective of the current study was to investigate the quality of life and associated factors of people living with HIV receiving first-line regimens at public hospitals in the Amhara region, Ethiopia.

Methods: A retrospective cohort study was conducted on 700 adult HIV-infected patients under treatment with first-line regimens, who were followed-up in 17 public hospitals in the Amhara region. A multivariate linear regression analysis was used for the current study.

Results: Of the 700 patients included in the current analyses, 59.5% (n=358) reported no impairment in self-care, while 63.1% (n=380) were extremely anxious/depressed. The overall expected EQ-5D utility score and visual analog scale (EQ-VAS) scores were 0.388 0.41 and 66.20 17.22 respectively. The current study indicated that the covariates sex, age of patient, level of education, appointment frequency, disclosure status of the disease, and substance use significantly affected the quality of life of people living with HIV and under treatment with first-line regimens. Hence, higher CD4 cell count and less detectable viral load lead to good quality of life of people living with HIV.

Conclusion: This study indicates that certain covariates have been identified as statistically significant predictors of the study variable "quality of life" of HIV-positive people. The findings obtained in the current investigation can help policy-makers to revise the current directives. The result obtained in this study can also help health staff to conduct health-related education during the treatment of HIV patients.

Keywords: quality of life, viral load, CD4 cell count, first-line regimes, HIV/AIDS, opportunistic infections

Introduction

Quality of life is among the major factors involving the status of health and well-being of HIV patients,[1] and improved quality of life is among the prominent goals of treatment.[2] Human immunodeficiency virus (HIV) affects immune cells, abolishing or weakening their function and acquired immune deficiency syndrome (AIDS) is the most advanced stage of HIV infection. HIV-infected patients have higher probability of being exposed to opportunistic infections (OIs) or developing HIV-related cancers compared to others.[3] For patients on first-line regimens, to have a long life with the HIV virus, it is recommended that viral replication is suppressed with good adherence which further leads to improvements of the quality of life of patients under treatment.[4]

Previously conducted research declared that about 36.9 million people living with the HIV/AIDS virus are under treatment.[5] However, many of the HIV patients under treatment with first-line regimens do not have good health-related

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conditions and are transferred to second-line regimens and this is a global public health concern that leads to more advanced treatment procedures.[6]

In Sub-Saharan Africa (SSA), about three fifths (59%) of women and girls under treatment continued to be transferred to more complicated treatment procedures in 2019.[7] Though young women in SSA constituted only 10% of the total population, they accounted for 24% of new HIV infections and did not have a good quality of life status in 2019.[8]

Ethiopia is one of the most affected SSA countries with an estimated 729,089 people living with HIV (PLWHIV) in 2018.[9] In Ethiopia, 0.9% of people aged 15–49 years are HIV positive, with a proportion of 1.2 and 0.6% among women and men, respectively.[9]

Quality of life of HIV patients under treatment is a multifactorial and multidimensional concept of physical, psychological, and social functioning and well-being.[10,11] At the same time, the impact of the factors directly or indirectly related to HIV infection needs to be considered due to the potential confounding effects of these factors on health-related quality of life.[12] Even though several studies were conducted previously on the quality of life of people under treatment, such studies vary in terms of their effects on different dimensions of quality of life and the associated factors.[13] Some of the studies measured quality of life of HIV patients based on either viral load or CD4 cell count or weight of patients.[14] Cross-sectional design studies were conducted previously to assess the quality of life of people living with HIV in this regard.[15,16] Assessing the quality of life of people living with HIV under treatment, especially with first-line regimens, is important for monitoring the impact of drugs and for the proper intervention of the program.[17] To the author's knowledge, there is a scarcity of research conducted applying a generic Euro-quality (EQ)-5D three-level (EQ-5D-3L) scale which is a WHO quality of life instrument. Therefore, the main objective of the current investigation was to assess the quality of life and associated factors of people living with HIV on first-line regimens in government hospitals of Amhara Region, Ethiopia. The current study considered two results namely, the generic EQ-5D-3L scale and treatment outcomes like viral load (VL), CD4 cell counts, and WHO disease stages for the assessment of quality of life of people living with HIV under treatment with first-line regimens.

Methods and Materials

Study Area and Period

The study was conducted on 700 HIV-infected people under treatment with first-line regimens in 17 public hospitals, in the Amhara region, Ethiopia. Amhara region is one of the eleven regions in Ethiopia which is located in North-west Ethiopia. The participants under investigation consisted of inpatients and outpatients on first-line regimens at the anti-retroviral therapy (ART) clinic in each hospital, whose follow-ups were from March 2018 to February 2021.

Study Design

An institutional-based longitudinal study design was used to investigate factors associated with the status of quality of life of HIV patients under treatment with first-line regimens.

Source and Study Population

The source population of this study was all HIV patients under treatment with first-line regimens. The study population comprised all patients with HIV/AIDS under treatment with first-line regimens who visited the ART clinic of the 17 public hospitals and fulfilled the eligibility criteria.

Sample Size and Sampling Techniques

The sample size was computed considering the single population proportion formula and the sample size (n) was found to be 700. The secondary data obtained in charts of each patient under treatment with first-line regimens were selected by a random sampling technique. Initially, the patient came to the ART clinic in each hospital according to their appointment for a refill of medication and to check up on their health status. A stratified random sampling or proportional allocation was conducted to determine the sample size in each hospital, based on the total number of patients under treatment. Then a systematic random sampling technique was employed using the id number of patients, to include those patients under investigation.

Study Variables

Dependent Variable

The dependent variable for the current investigation was the quality of life of people living with HIV and under treatment with first-line regimens. For the assessment of quality of life of PLWHIV, a generic EQ-5D three-level (EQ-5D-3L) scale and medical outcomes such as VL, CD4 cell counts, WHO disease stages, and Body Mass Index (BMI) were considered.

Independent Variables

The important independent variables were categorized as socio-demographic, clinical and economic variables and individual characteristics. The categories of these variables are indicated in Table 1 and Table 2.

Study Instrument and Data Collection Procedures

In this study, the EQ-5D-3L scale and visual analog scale (VAS) were used for quality assessment. Here, EQ-5D assesses the five health domains namely mobility, self-care, usual activities, full illness/pain, and the existence of depression, and each dimension was evaluated at three levels (healthy, moderate/some extent, extremely/series problem). About 243 different health states were considered to describe the health status of the study population. These health states produce

Table 1 Baseline Characteristics and Categories of Socio-Demographic Variables (n=700)

Name of Variable	Categories	Frequency	Percentage (%)
Sex	Male	375	53.6
	Female	325	46.4
Patient category	Children (<15 years)	254	36.3
	Adult (≥ 15 years)	446	63.7
Marital status at initiation of second line regimen	Living with partner	318	45.4
	Living without partner	382	54.6
Level of education	Not educated	220	31.4
	Educated	480	68.6
Viral suppression at initiation of first-line regimens	Suppressed/undetectable	258	36.9
	Unsuppressed /detectable	442	63.1
Clinical WHO stages at the time of initiation of second line regimen	Stage I	106	15.1
	Stage II	118	16.9
	Stage III	231	33
	Stage IV	245	35
Residence area	In rural area	159	22.7
	In urban area	541	77.3
Partner's HIV status at initiation of second line region	Negative	81	11.6
	Not Applicable	139	19.9
	Positive	230	32.9
	Unknown	250	35.7
Functional status at the time of transfer to second line regimen	Ambulatory	107	15.3
	Bed ridden	23	3.3
	Working	570	81.4
HIV/TB co-infection at the time of transfer to second line regimen	Negative	658	94
	Positive	42	6
Alcohol intake	No	683	97.6
	Yes	17	2.4
HIV disclosure Status	Disclosed	476	68
	Not disclosed	224	32
Smoking Status	No	621	88.7
	Yes	79	11.3
Opportunistic infections	No	612	87.4
	Yes	88	12.6

Table 2 Baseline Characteristics and Categories of Clinical Variables (n=700)

Name of Variable	Categories	Frequency	Percentage (%)
Viral load	Undetectable	189	32.7
	Detectable	389	67.3
Clinical WHO stages	Stage I	118	20.4
	Stage II	120	20.8
	Stage III	186	32.2
	Stage IV	154	26.6
Partner's HIV status	Negative	54	9.3
	Not Applicable	120	20.8
	Positive	189	32.7
	Unknown	215	37.2
Functional status	Ambulatory	96	16.6
	Bed ridden	35	6.1
	Working	447	77.3
HIV/TB co-infection at enrollment	Negative	349	60.4
	Positive	229	39.6
Adherence status	Adherent	227	39.3
	Non-adherent	351	60.7
HIV disclosure Status	Disclosed	445	77
	Not disclosed	133	23
Opportunistic infection status	No	254	43.9
	Yes	324	56.1
Drug toxicity	No	257	44.7
	Yes	321	55.5
Treatment status	Failed status	472	67.3%
	Good staus	228	32.7%

a value set (index score) ranging from 1 (for good health state, 11111) to − 0.784 (for poor health state, 33333), where a negative sign indicates poor quality of life of people living with HIV. The EQ-5D-3L also includes a visual analog scale (EQ-VAS), which is a vertical 20 cm calibrated line ranging from 0 to 100, where the value 0 stands for poor quality and the value 100 stands for good health quality. Previous studies indicated that the two health status measures, EQ-5D-3L and EQ-VAS were validated to triangulate the quality of life of people living with HIV. The internal consistency was tested using Cronbach's alpha value of 0.72 for the current study. Data collection was performed in the ART section of each hospital. The data collection consisted of two parts: the first part covered the socio-demographic and clinical characteristics of the participants, while the second part consisted of the EQ-5D-3L and EQ-VAS. All these were done using the charts of HIV patients in the ART section of each hospital. Data were collected by the health staff with close follow-ups of an investigator. Orientation about the variables included under this study was given to data collectors by the investigator. The sensitivity of the generic EQ-5D-3L was used to differentiate the quality of life measured interims of treatment outcomes such as VL, CD4 cell outcomes, and the like. This approach has great advantages in generating health utility scores used to measure economic evaluation.[18]

Model Adequacy Checking

The important assumption of linear models such as the linear relationship between dependent and independent variables, the independence of all observations, normality, homoscedasticity, and normality and random distribution of the error terms were investigated. The Durbin-Watson test was conducted for the investigation of the serial correlation of the residuals. Case-wise diagnostics were also conducted to test the selection criterion for outliers above standard deviation. Cooks distance was conducted for overall measures of influence on all parameters and was conducted to test the goodness-of-fit statistics.

Data Analysis

The WHO quality of life of people living with HIV was used to investigate the quality of life of people living with HIV under treatment with first-line regimens. The expected scores of items within each domain were used to calculate the domain score. Data analysis was conducted using SAS software. Descriptive statistics (frequency, mean and SD) were used for frequency distributions of responses.

Results

Socio-Demographic Information

Out of a total of 700 HIV-positive people, 53.6% were males, 54.6% were living without their partners, 68.6% were educated, 63.1% were virally unsuppressed, and 77.3% of them were urban residents. The majority of them (81.4%) had working status. Among participants included in this investigation, about 32% of them did not disclose their HIV status to family members. In this investigation, about 35% of the participants had WHO clinical stage IV and about 6% of the patients were HIV/TB co-infected at the enrollment stage. About 2.4%, 3.9%, and 4% of the patients were alcohol consumers, smokers, and had opportunistic infections such as pneumonia, salmonella infection, candidiasis, toxoplasmosis, and tuberculosis (TB) respectively. The baseline characteristics of the participants and categorical variables are indicated in Table 1.

Similar to the categorical variables, continuous variables were also summarized in this investigation. In this regard, the median weight of the patients was 48kg (with inter-quartile range (IQR) 52, 64), and the median age in years of all patients was 30.67 years (with IQR: 22, 38).

Clinical Variables During HAART

The clinical outcome variables at the initiation of the first-line regimens and each visit of the first-line regimen were also recorded. The clinical outcome variables were recorded at the end of the study time as indicated in Table 2.

As indicated in Table 2, about 67.3% of the patients had treatment failure (low CD4 cell count and detectable VL), 77.3% of the patients had working status, 60.7% of the patients under treatment were non-adherent, 23% of the patients did not disclose their status to people living with them, 56% of them had other opportunistic infectious diseases and 55.5% of the patients had drug toxicity. To identify the covariates that should be included in the multivariate data analysis, univariate data analysis was conducted as shown in Table 3. As indicated in the univariate data analysis in

Table 3 Univariate Data Analysis on Health Status Indicators for People Living with HIV (n=700)

Variable	Mean (SD) /%
EQ-5D index score (Mean ± SD)	0.432 ± 0.25
VAS score (Mean ± SD)	64.42 ± 2.25
Viral load (Mean ± SD)	658 ± 0.54
CD4 cell count (Mean ± SD)	168 ± 1.68
BMI (Mean ± SD)	18.25 ± 1.82
Variable	n (%)
HIV functional status	
Working	355(50.7)
Ambulatory	145(20.7)
Bedridden	200(28.6)
Depression/anxiety	
Yes	278(39.7)
No	422(60.3)
Self-care	
Yes	455(65)
No	245(35)

Table 3, the covariates age of patients and CD4 cell count at initiation of the second-line regimen were significant at 25% CI. Similarly, factors such as patient category, marital status, sex of patient, opportunistic infections, the existence of mental depression, disclosure of HIV status, residence area, level of education, adherence to highly active anti-retroviral therapy (HAART), HIV functional status, smoking status, alcohol intake status, drug toxicity, and WHO clinical stages were also significant at 25% CI. Hence, all these variables should be included for multivariate data analysis in the identification of associated factors for treatment failure. Among those patients who disclosed their disease status, a considerable number of them (65%) declared social support was given to them by families and communities around them. Similarly, an incidence of mental depression among the participants was also inventoried using Beck's depression inventory scale at each visit and the result showed that 27 (3.7%) of them were mentally depressed.

The nature of the missingness pattern in the current investigation was tested using a logistic regression model which is known to be monotone (dropouts). The pattern indicates that there were no missing observations in the first two visits and the number of dropouts increased linearly as follow-up times/visits increased. The result, in this regard, revealed that dropouts were not affected by the previous outcomes ($t = 0.5017$, $p = 0.862$). Hence, the missingness pattern was Missing Completely at Random (MCAR).

Model Adequacy Checking Result

Standard multiple regression analysis was used to assess the ability of socio-demographic and clinical characteristics to predict the quality of life of people living with HIV. To assess normality, linearity, multicollinearity, and homoscedasticity, preliminary analyses were conducted. A goodness of fit model was conducted for multivariate linear regression with $F = 188.12$ and $P < 0.01$, adjusted $R^2 = 0.781$. The univariate data analysis related to health status indicator is indicated in Table 3.

Table 3 indicates that the overall mean of EQ-5D utility score was 0.432 with a standard deviation of 0.25. Of the 700 participants, about half of them (56.0%), reported that they had working status and about 29% of the patients were bedridden. The expected number of viral load was 658 copies/ mm3 with a standard deviation of 54 copies /mm3 and the expected number of CD4 cell count for all of the patients was 168 cells/mm3 with a standard deviation of 35.2 cells/ mm3. Among the participants, about 35% of them could not take care of themselves and about 40% of the participants had depression/anxiety problems.

The generic Euro quality of life and visual analog scale for each of the categories of covariates was investigated as shown in Table 4. Table 4 indicates that the overall mean of EQ-5D-3L vs visual analog scale (EQ-VAS) score was 66.20 with SD=17.22. Generally, different indicators for quality of life were observed across all of the participants. Among the health indicators, about 68 (11.3%) of the respondents reported a completely healthy state (state: 11111 with an index

Table 4 Health Status Classification for People Living with HIV (n=700)

Serial Number	EQ-5D Status	n (%)	Index of EQ-5D
1	11111	62(8.9)	0.897
2	11112	65(9.3)	0.456
3	11113	55(7.9)	0.765
4	11121	44(6.3)	0.145
5	11122	43(6.1)	0.156
6	11123	37(5.3)	0.567
7	11212	52(7.4)	0.976
8	11212	58(8.3)	0.812
9	11213	16(2.3)	0.189
10	11222	27(3.9)	0.843
11	11223	38(5.4)	0.695
12	12113	49(7.0)	0.768
13	12213	5(0.7)	0.376
14	21223	16(2.3)	0.919
15	22113	27(3.9)	0.593
16	21223	15(2.1)	0.583
17	22113	22(3.1)	0.845

(*Continued*)

Table 4 (Continued).

Serial Number	EQ-5D Status	n (%)	Index of EQ-5D
18	22223	8(1.1)	0.764
19	22233	13(1.9)	0.564
20	23223	17(2.4)	−0.491
21	23323	5(0.7)	−0.321
22	23323	6(0.9)	−0.686
23	32223	12(1.7)	−0.849
24	33333	8(1.1)	−0.594
	Total	700 (100.0)	

value of 1) and with no loss in any domain, about 86 (14.3%) of the participants indicated a moderate problem in the first four domains and severe loss in the fifth domain (state: 22223, index value: 0.764), while 23 (3.8%) reported poor health state (state: 33333, the index value of −0.594) with extreme loss in all the five domains of EQ-5D-3L (Table 4).

Table 5 indicates that there was a significant difference in quality of life between variables/among categories of variables.

Table 5 Results of EQ-5D Difference Scores by Sample Characteristics (n=700)

Characteristics	EQ-5D-3L Mean ± SD	95% CI	p-value	EQ-VAS Means ± SD	95% CI	p-value
Gender						
Male	0.43 ± 0.51	(0.35, 0.48)	< 0.01	62.9±15.82	(58.32, 65.61)	< 0.01
Female	0.32 ± 0.62	(0.25, 0.37)		57.71 ± 15.16	(52.15, 61.21)	
Age						
Children (<15 years)	0.34 ± 0.22	(0.25, 0.37)	< 0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
Adults (≥15 years	0.72 ± 0.002	(0.78, 0.78)		80.21 ± 4.86	(78.34, 86.29)	
Marital status						
Living with partner	0.62 ± 0.32	(0.25, 0.37)	0.002	57.71 ± 15.16	(52.15, 61.21)	0.014
Living without partner	0.82 ± 0.022	(0.78, 0.78)		80.21 ± 4.86	(78.34, 86.29)	
Educational Level						
Illiterate	0.32 ± 0.721	(0.25,0.37)	< 0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
Literate	0.72 ± 0.002	(0.78,0.78)		80.21 ± 4.86	(78.44, 87.29)	
Employment Status						
Employed	0.42 ± 0.322	(0.25,0.37)	< 0.01	57.71 ± 15.16	(53.15, 61.21)	< 0.01
Unemployed	0.72 ± 0.021	(0.78,0.78)		80.21 ± 4.86	(78.34, 86.29)	
HIV functional status						
Working	0.32 ± 0.321	(0.25,0.37)	< 0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
Ambulatory	0.82 ± 0.022	(0.58,0.80)		82.21 ± 3.86	(78.34, 86.29)	
Bedridden	0.72 ± 0.121	(0.78,0.78)		81.21 ± 4.46	(76.34, 88.19)	
Appointment frequency	0.32 ± 0.321	(0.25,0.37)	< 0.01	56.71 ± 15.16	(54.15, 62.21)	
Adherence status						
Adherent	0.32 ± 0.32	(0.25,0.37)	< 0.01	57.71 ± 15.16	(53.25, 62.21)	< 0.01
Non-adherent	0.72 ± 0.002	(0.78,0.78)		80.21 ± 4.86	(78.34, 86.29)	
Opportunistic Infections						
Yes	0.32 ± 0.32	(0.25,0.37)	< 0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
No	0.72 ± 0.002	(0.78,0.78)		78.21 ± 4.86	(75.34, 82.29)	
HIV disclosure status						
Yes	0.32 ± 0.32	(0.25,0.37)	<0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
No	0.72 ± 0.002	(0.78,0.78)		79.22 ± 4.86	(75.14, 85.29)	
Substance use						
Yes	0.42 ± 0.32	(0.25,0.57)	<0.01	57.71 ± 15.16	(52.15, 61.21)	< 0.01
No	0.72 ± 0.002	(0.68,0.78)		80.21 ± 4.86	(78.34, 86.29)	

The univariate and multivariate linear regression results in Table 6 indicate that the EQ-5D tools significantly differentiate the quality of life of people living with HIV. Hence, there was significant difference between males and females, children and adults, living with partners and without partners, educated and illiterate, employed and unemployed, working status, ambulatory and bedridden, adherent and non-adherent, substance users and non-users. Hence, gender, age of patients, marital status, level of education, employment status, HIV functional status, medication adherence status, disease disclosure status, opportunistic inactions, and substance use status significantly affected the quality of life of people living with HIV (refer to Table 6). The normality of the data was assessed using QQ-plot and Shapiro-wilk test ($p> 0.05$). Model statistics, $F=178.8$; $p< 0.001$; $R^2=0.885$ and adjusted $R^2=0.881$.

The multivariate data analysis in the current study indicated that male patients had better quality of life as compared to females. Hence, the expected difference in quality of life of male and female patients was 5.19±0.62 (p-value < 0.001) keeping the other conditions constant.

Table 6 Univariate and Multivariable Linear Regression Data Analysis in Identifying Predictors for Quality of Life (n=700)

Patient Characteristics	EQ-5D Value (Univariate Linear Regression)		P-value	EQ-5D Index Value (Multivariate Linear Regression)		p-value
	Unstandardized β	95% CI		Unstandardized β	95% CI	
Gender			< 0.01			< 0.01
Male	0.43 ± 0.51	(0.35, 0.48)		62.9 ± 15.82	(58.32, 65.61)	
Female	0.32 ± 0.62	(0.25, 0.37)		57.71 ± 15.16	(52.15, 61.21)	
Age			< 0.01			< 0.01
Children (<15 years)	0.34 ± 0.22	(0.25, 0.37)		87.71 ± 15.16	(52.15, 61.21)	
Adults (≥15 years	0.72 ± 0.002	(0.78, 0.78)		80.21 ± 4.86	(78.34, 86.29)	
Marital status			0.002			0.014
Living with partner	0.62 ± 0.32	(0.25, 0.37)		92.71 ± 15.16	(52.15, 61.21)	
Living without partner	0.82 ± 0.022	(0.78, 0.78)		80.21 ± 4.86	(78.34, 86.29)	
Educational level			< 0.01			< 0.01
Illiterate	0.32 ± 0.721	(0.25,0.37)		57.71 ± 15.16	(52.15, 61.21)	
Literate	0.72 ± 0.002	(0.78,0.78)		80.21± 19.86	(78.44, 87.29)	
Employment status			< 0.01			< 0.01
Employed	0.42 ± 0.322	(0.25,0.37)		87.71 ± 15.16	(53.15, 61.21)	
Unemployed	0.72 ± 0.021	(0.78,0.78)		80.21 ± 4.86	(78.34, 86.29)	
HIV functional status			< 0.01			< 0.01
Working	0.32 ± 0.321	(0.25,0.37)		57.71 ± 15.16	(52.15, 61.21)	
Ambulatory	0.82 ± 0.022	(0.58,0.80)		42.21 ± 3.86	(38.34, 56.29)	
Bedridden	0.72 ± 0.121	(0.78,0.78)		38.21 ± 4.46	(32.34, 52.19)	
Appointment frequency	0.32 ± 0.321	(0.25,0.37)	< 0.01	56.71 ± 15.16	(54.15, 62.21)	
Adherence status			< 0.01			< 0.01
Adherent	0.32 ± 0.32	(0.25,0.37)		57.71 ± 8.96	(53.25, 62.21)	
Non-adherent	0.72 ± 0.002	(0.78,0.78)		30.21± 3.86	(28.34, 46.29)	
Opportunistic. infections			< 0.01			< 0.01
Yes	0.32 ± 0.32	(0.25,0.37)		57.71 ± 5.16	(52.15, 61.21)	
No	0.72 ± 0.002	(0.78,0.78)		78.21 ± 7.86	(75.34, 82.29)	
Existence of depression			0.014			0.015
Yes	0.28 ± 0.702	(0.15, 0.35)		54.27 ±0.702	(48.21, 59.16)	
No	0.78 ± 0.502	(0.53,0.87)		75.34 ± 0.642	(67.28, 80.43)	
HIV disclosure status			<0.01			< 0.01
Yes	0.32 ± 0.32	(0.25,0.37)		82.71 ± 5.16	(72.15, 91.21)	
No	0.72 ± 0.002	(0.78,0.78)		79.22 ± 4.86	(70.14, 85.29)	
Substance use			<0.01			< 0.01
Yes	0.42 ± 0.32	(0.25,0.57)		57.71 ± 5.16	(52.15, 61.21)	
No	0.72 ± 0.002	(0.68, 0.78)		80.21±6.86	(78.34, 86.29)	

Age was another significant variable affecting the quality of life of HIV patients on first line regimen. Comparing children with adults, the expected quality of life difference for the two groups was 7.5±7.5 (p-value <0.01), given the other conditions were constant.

Marital status significantly affected the quality of life of HIV patients on first line regimens. The expected quality of life difference between patients living with and without a partner was 12.5±10.3, keeping the other conditions constant.

Educated patients had better quality of life as compared to uneducated/illiterate patients. Hence, the expected difference in quality of life of educated and uneducated patients was 22.5±4.7, keeping the other conditions constant.

Employment status affected the quality of life of HIV patients on first line regimens. Employed patients or patients with enough level of income had better quality of life as compared to unemployed patients. The result in Table 6 indicates that the expected quality of life difference between employed and unemployed patients was 7.5±11.7, given the other covariates were constant.

HIV functional status also affected the quality of life of people living with HIV. Patients with working functional status had better quality of life as compared to ambulatory and bedridden patients. Similarly, clinic appointment frequency significantly affected the quality of life of patients. As patients had frequent appointments as per the given prescription, the quality of life of such patients also significantly improved.

Treatment adherent patients had better quality of life as compared to non-adherent patients. Hence, the expected difference in quality of life of adherent and non-adherent patients was 27.5±5.1, given the other covariates were constant.

Patients without opportunistic infections had better quality of life as compared to patients with opportunistic infections. The expected difference in quality of life of patients with and without opportunistic infections was 20.5 ±2.7, given the other covariates were constant.

The disclosure of HIV disease status also significantly affected qualify of life. The expected difference in quality of life of patients who disclosed and did not disclose their disease status was 3.49 ± 0.3, given the other covariates were constant.

Patients addicted to substances had low quality of life as compared to those patients without substance use. The expected difference in quality of life of HIV patients with and without substance use was about 23 +1.7, given the other covariates were constant. Furthermore, the present study indicated that suppression of viral load is a good indicator of better quality of life of people living with HIV.

Discussion

Important variables that significantly affect the quality of life of people living with HIV have been identified in the current study. Hence, sex of patient, age of patient, employment status, level of education, opportunistic infections, disclosure status of the disease, marital status, HIV functional status, appointment frequency, treatment adherence status, and substance use were significantly associated with the quality of life of people living with HIV under treatment on first line regimens.

Regarding sex of patients, male patients had better quality of life as compared to females and this result is supported by one of the previous studies.[19] The potential reason for this might be that males have better source of income as compared to females. Hence, most of the time the economic activities in the households of the study area are authorized by males and expenditures are directed by males rather than females. The other potential reason may be the fact that all activities such as cooking and child care are laid on the shoulder of females. In general, females are the most marginalized population, perhaps due to the high stigma and discrimination against them and this also leads to poor quality of life.[20]

Comparing children with adults and old people, children have better quality of life, as children had high number of CD4 cell count as compared to adults. High CD4 cell count is one of the indicators of better quality of life. This result is supported by a previous study.[21] The previous study states that in individuals over 50 years of age with HIV, it is worthwhile to explore the presence of comorbidities, frailty, anxiety, and depression to improve the survival and health-related quality of their life.[22]

Marital status significantly affects the quality of life of HIV patients. Patients living with their partners have better quality of life as partners may help each other with taking medication according to the prescription given by the health

care workers. This means, partners can help by reminding to take pills, food and other related medication timely. This result is supported by a previous study[23] and contradicted by another study.[24] The study result in the contradicted research stated that patients living together have frequent sexual intercourse and this leads to extra infections and poor quality of life. The result obtained from the previous study declared that the average quality of life of people living with HIV score for singles was more than married and widowed patients, which is contradicted in this research.[25] Another study states that being in a relationship is a good predictor of quality of life as it lowers the chances of loneliness and depression.[8] Hence, this result needs further investigation for consistency.

Education plays a significant role in the variation of quality of life of HIV patients on first line regimens. Educated patients have better understanding of the use of strict adherence to medication guidelines and give emphasis for their life. Educated people also know what is better and what is worse related to their life as compared to uneducated ones. This result is supported by the research conducted previously.[26]

Employment status significantly affects the quality of life of people living with HIV under treatment. Employed patients may have sustainable income and can access better availability of food and medication as compared to unemployed ones. This result is supported by another study.[27] Another study supported the result by stating that employment could be linked to higher social well-being of people living with HIV.

HIV functional status also affects the quality of life of people living with HIV. Patients with working functional status had better quality of life as compared to ambulatory and bedridden patients. The potential reason for this might be that patients who are ambulatory or bedridden have low number of CD4 cell counts and may have detectable viral load and worse WHO HIV stages (Stage IV or stage III). This result is supported by another previously conducted study.[28]

Treatment adherent patients who frequently visited the health institutions based on the prescription given by the health staff have better quality of life as compared to non-adherent patients. Most of the time non-adherent patients do not take medication on time and they may drink alcohol and use other substances. Such behavior may cause drug interaction effect and lead to poor quality of life and treatment failure.[29] A previous study declared that only adherent patients and adherence is linked to viral suppression and subsequent asymptomatic state for better quality of life for HIV patients under treatment with first-line regimens.

Patients free from any other opportunistic infection have better quality of life as compared to those who have opportunistic infections. Opportunistic infections have their own side effects on the quality of life and the drug taken for the opportunistic infections may affect the effectiveness of the ART drug. This result is supported by another study.[30]

The status of disclosure of the HIV disease also significantly affects the quality of life of HIV patients under treatment with first-line regimens. Patients who have disclosed their disease status can take the drug timely irrespective of people around them. They do not worry about the people around them as the people around them are aware of the disease. This result is supported by other studies.[31,32] Patients addicted to substances had low quality of life as compared to those patients without substance use. Patients who are addicted to substances may forget when to take the drugs. Even if he/she takes the drug on time the substance they take may affect the effectiveness of the drugs taken.[33]

High level of depression significantly affects the quality of life of HIV patients under treatment with first-line regimens. Patients who have severe depression and anxiety may not be happy with their life, may not take medication timely, and this leads to poor quality of life. Previous studies have shown that more than 10% of anxiety and depression are key factors affecting the quality of life of patients.[34] Therefore, psychological interventions are needed in ART clinics to improve the quality of life of HIV patients under treatment with first-line regimens. A randomized controlled trial conducted previously reported that multi-component behavioral interventions had resulted in a significant reduction in anxiety and depression within 3 months in psychologically distressed adults.

Regarding the EQ-VAS score in the current study, the result obtained in this study is consistent with another previously conducted study[35] with VAS median score of 90 for people living with HIV. Regarding the sensitivity of EQ-5D, having WHO stages III or IV significantly lowered the quality of life of people living with HIV.[19]

The two results obtained from EQ-5D VAS and quality of life measured using domains and CD4 cell counts >200 cells/mm3 are approximately similar. Hence, patients with high expected quality of life have high number of CD4 cell counts, undetectable viral loads, and low WHO HIV stages. Similarly, other studies have reported CD4

lymphocytes count as an important predictor of other domains of quality of life of people living with HIV under treatment.[36]

Furthermore, suppression of viral load is a good indicator of better quality of life of people living with HIV. Several other studies have declared that viral suppression leads to enhanced physical health[5] and mental health,[37] and this can only be accomplished through a consistent lifelong adherence to ART.[38] Another advantage of viral suppression is that it stops the transmission of HIV to a non-HIV partner.[39]

Strengths and Limitations

As a strength, this study is the first in the study area with large study sites (17 public hospitals) and large enough number of participants. An important point that can be considered as a strength of the current study is that, EQ-5D VAS was used in the current study. This helps to compare and contrast with the results obtained from the WHO standardized tool, EuroQol questionnaire, in its sensitivity and this further helps to differentiate the quality of life of people living with HIV based on disease stage, VL and CD4 cell counts. The current findings have implications for medical decision-making in terms of designing evidence-based interventions across age groups and cultures by considering the chronic nature of HIV infection and patient-reported outcomes.

This study was not without limitations. One of the limitations was that patients who failed to attend regular follow-up s based on their dispensing records were not properly recorded. Including such events may reveal additional information for policy issue.

Conclusion

The study indicated that medication and related adherence of people living with HIV in the study area resulted in better quality of life as compared to non-adherent patients. The two results obtained from EQ-5D VAS and quality of life measured using domains and CD4 cell counts >200 cells/mm3 are approximately similar. Hence, patients with high expected quality of life have high number of CD4 cell counts, undetectable viral loads, and low WHO HIV stages.

The instrument used to assess the quality of life (the EQ-5D-3L) was found to be sensitive in detecting quality of life differences. The EQ-5D-3L instrument considered HIV clinical stages, number of CD4 cell counts, and viral loads.

Hence, male HIV patients, older age (adults), illiterate patients, HIV patients living without partner, patients with detectable viral load (>1000 copies/mm3), unemployed patients, patients with low CD4 cell count, rural patients, HIV patients with opportunistic infection, HIV patients who have not disclosed their HIV status, and being addicted to a substance were factors which led to poor quality of life of HIV patients in the study area.

The findings of the present study provide support for future work, to design effective and holistic interventions that are culturally sensitive for the study area. Further studies on the determinants of health outcomes in this vulnerable population are also warranted.

Abbreviations

PLWHIV, people living with HIV; VL, viral load; CD4, classification determinant four; HIV, human immune deficiency virus; CI, confidence interval; VAS, visual analog scale; QoL, quality of life.

Ethical Approval and Consent to Participate

The data used in the current investigation were secondary and there was no way of contacting respondents to obtain consent to participate from participants, because of this fact, informed consent requirement has been waived. To secure confidentiality and for compliance with the Declaration of Helsinki within the manuscript, regarding patient-related data, the names of patients were not given to investigators, rather id number and important variables related to the current investigation were given to researchers. The waiver was granted by Bahir Dar University Ethical approval committee, Ethiopia with reference number: RCS/1412/2021. Hence, the Bahir Dar University Ethical Committee approved this study and waived informed consent requirement.

Consent for Publication

The manuscript submitted to this journal has not been published elsewhere and has not been considered for publication by any other journal.

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Disclosure

The author declares no conflicts of interest in this work.

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