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Health-Related Quality of Life Among People Living with HIV in Vietnam, a Three-Year Longitudinal Analysis

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Abstract

This study examined changes in health-related quality of life (HRQOL) among people living with HIV in Vietnam over three years following antiretroviral therapy (ART) initiation. We analyzed data from a randomized trial of 639 ART-naïve patients in which HRQOL was measured using the SF-8 instrument. Mixed effects logistic regression was used to assess changes in HRQOL over time and identify associated factors. At baseline, 57.5% reported low HRQOL. HRQOL improved rapidly after ART initiation, with 89.0% reporting good HRQOL at 3 months and 96.4% at 36 months. Compared with men, women had slower improvement in HRQOL over time. Factors positively associated with HRQOL included higher BMI and alcohol use, while food insecurity, history of tuberculosis, advanced clinical stages, and TDF-based regimens were negatively associated. Older age was linked to poorer HRQOL outcomes. These findings highlight the effectiveness of ART in improving HRQOL while also revealing disparities in HRQOL improvements.

Keywords HIV · ART · Quality of life · HRQOL · Vietnam · Longitudinal study · SF-8 · PLHIV

Resumen

Este estudio examinó los cambios en la calidad de vida relacionada con la salud (CVRS) en personas que viven con VIH en Vietnam durante tres años tras iniciar la terapia antirretroviral (TAR). Se analizaron datos de un ensayo aleatorizado con 639 pacientes naïve a TAR, midiendo la CVRS con el instrumento SF-8. Se utilizó regresión logística de efectos mixtos para evaluar los cambios y factores asociados. Al inicio, el 57,5% reportó baja CVRS. La CVRS mejoró rápidamente tras la TAR, con un 89,0% reportando buena CVRS a los 3 meses y un 96,4% a los 36 meses. En comparación con los hombres, las mujeres mostraron mejoras más lentas. Un mayor IMC y el consumo de alcohol se asociaron positivamente, mientras que la inseguridad alimentaria, antecedentes de tuberculosis, estadios clínicos avanzados y regímenes basados en TDF se asociaron negativamente. La edad avanzada se vinculó a peores resultados. Estos hallazgos destacan la efectividad de la TAR y las disparidades en las mejoras de la CVRS.

Introduction

The goals of antiretroviral therapy (ART) are to reduce HIV-related morbidity and mortality, restore and preserve immunologic function, maximally and durably suppress the viral load, prevent HIV transmission, and improve quality of life [1]. Globally, the scale-up of ART has dramatically changed the lives of people living with HIV (PLHIV), transforming HIV infection into a chronic disease and increasing life expectancy to approach that of HIV-uninfected individuals [2]. Globally, more than 29 million people were receiving ART by the end of 2022 [1]. Many countries are approaching the UNAIDS 95-95-95 targets, whereby 95% of all PLHIV know their HIV status, 95% of all people with

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diagnosed HIV infection are receiving sustained ART, and 95% of all people receiving ART have a suppressed viral load [1].

Despite significant reductions in morbidity and mortality, PLHIV, including those who have achieved viral suppression, face significant stressors that can affect their well-being and quality of life [3, 4]. Compared to the general population, PLHIV, even those on ART with a suppressed viral load, have significantly lower health-related quality of life (HRQOL) compared to the general population [4]. This has led to calls for the consideration of HRQOL as a key HIV programmatic goal in addition to the current testing and treatment targets [3, 5].

HRQOL is a multidimensional construct concerned with the impact of health on an individual's perception of their wellbeing and level of functioning in important areas of their life [6]. In studies among PLHIV, better HRQOL has been associated with ART adherence and HIV viral suppression [7, 8]. However, evidence suggests that in addition to underlying HIV infection, social circumstances, comorbidities and stigma may impact HRQOL in people with HIV [3]. Recent data from Australia and the United States suggest that only around 50–72% of PLHIV report good HRQOL in those settings [9, 10]. Data on HRQOL of PLHIV in low- and middle-income countries is limited.

Vietnam has a concentrated HIV epidemic with most infections occurring in key populations, including people who inject drugs (PWID), men-who-have-sex-with-men (MSM), transgender women (TW) and female sex workers (FSW). As of 2023, approximately 250,000 people are estimated to be living with HIV, and 183,458 of these individuals are receiving antiretroviral therapy (ART), with 72% achieving viral load suppression [11]. Stigma and discrimination, mental health, gender disparities, level of education, and financial stress have been shown to be associated with lower quality of life among PLHIV in Vietnam [12–14]. To better understand how ART affects HRQOL among PLHIV in Vietnam, we studied the change in HRQOL among a cohort of patients over three years after initiating ART.

Methods

Study Population

We used data from the Viral Load Monitoring in Vietnam (VMVN) Study, a prospective, randomized controlled trial of routine viral load monitoring versus standard monitoring in a patient population starting ART between 4/2011 and 4/2014. Standard monitoring included CD4 count testing every six months and targeted viral load testing to confirm suspected treatment failure based on the presence of clinical and/or immunological criteria [15]. The intervention group received viral load testing every six months in addition to the standard monitoring approach. The study methodology is described in detail elsewhere [16].

A total of 657 patients signed the consent form, but nine were excluded for not meeting all eligibility requirements. The remaining sample (n = 648) was randomized into two groups: standard monitoring (n = 344) and viral load monitoring (n = 304). One patient in the control group died before ART initiation and was excluded. Seven patients who did not complete questions about HRQOL at baseline were excluded (1.1%). One patient who did not have hepatitis B and hepatitis C infection status documented was also excluded. The remaining 639 patients were included in this analysis.

Ethical Considerations

The study was approved by the Institutional Review Board of Beth Israel Deaconess Medical Center (#2010P000334) in Boston, USA and the Ethical Committee of Bach Mai Hospital in Hanoi, Vietnam. All subjects provided written informed consent prior to study participation. The VMVN study was registered at www.clinicaltrials.gov (ClinicalTrials.gov identification number: NCT01317498). The study was conducted in accordance with the principles of the Declaration of Helsinki.

A Conceptual Framework for QOL and HRQOL

Quality of life, as defined by the World Health Organization (WHO), refers to "individuals' perceptions of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns" [17]. It considers multiple aspects of a person's life, including their physical health, mental well-being, level of independence, social relationships, personal beliefs, and their surrounding environment.

WHO developed and validated a comprehensive tool to assess overall quality of life (WHOQOL) across five key domains: physical health, psychological health, level of independence, social relationships, and environment (Fig. 1). The original instrument, known as the WHOQOL-100, consists of 100 items. To enhance practicality and reduce respondent burden, the WHO later introduced the WHOQOL-BREF – a shorter, 26-item version of the original questionnaire [17].

The WHOQOL is broad in scope, capturing a wide range of life domains beyond health. In contrast, the SF-36 – developed by the RAND Health Care team – is more focused on health-related issues. It measures areas that are commonly affected by illness and treatment (HRQOL) [18].

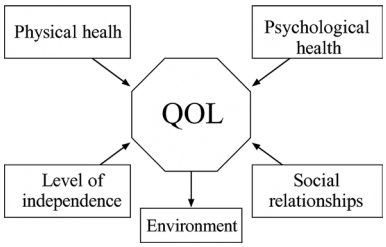

Fig. 1 WHO conceptual framework for QOL

The SF-36 includes 36 questions across eight domains: general health, physical functioning, bodily pain, vitality, social functioning, role limitations due to physical and emotional problems, and mental health.

A study evaluating the WHOQOL-BREF and SF-36 in 224 patients with HIV found both instruments to be reliable and valid for assessing health-related quality of life, with strong internal consistency, meaningful correlations with clinical indicators such as CD4 count and symptom burden [19].

HRQOL Measures

Based on lessons learned from a previous study, we selected the SF-8 – a shortened version of the SF-36 – for this evaluation, as the SF-36 demonstrated low completion rates and patients frequently required substantial assistance when completing it [20]. The SF-8 has been previously validated and used [20, 21]. It includes one item representing each of the eight HRQOL domains: general health (GH), physical functioning (PF), role physical (RP), role emotional (RE), social functioning (SF), bodily pain (BP), mental health or emotional wellbeing (MH), and vitality or energy/fatigue (VT). It generates a health profile of eight discrete scores describing HRQOL, which are summarized into physical component (PC) and mental component (MC) continuous summary scores. In this study, HRQOL was assessed using the SF-8 at baseline and at every three months until 36 months of ART. Patients were asked to complete the survey by self-reporting their perceptions of HRQOL over the past four weeks (Table 1).

Covariates

Data collected at baseline included gender, age, number of years of education, smoking, alcohol use, food insecurity, body mass index (BMI), HIV transmission route, history of tuberculosis (TB) and current TB treatment, history of opportunistic infections (OIs), WHO clinical stage for HIV/AIDS, CD4 cell count, hepatitis B virus (HBV) and hepatitis C virus (HCV) infections, prior ART, baseline ART regimen, and intervention status (routine viral load monitoring versus standard monitoring). Current OIs was not included as it was highly correlated with WHO clinical stage.

HBV and HCV infections were defined as follows: no evidence of current HBV or HCV infection (HBsAg negative, anti-HCV negative); current HBV infection only (HBsAg positive, anti-HCV negative); current or past HCV infection only (HBsAg negative, anti-HCV positive); and current HBV infection and current or past HCV infection (HBsAg positive, anti-HCV positive). Patients were categorized as being food insecure if they answered "yes" to any of the nine food insecurity-related questions during the past four weeks [22].

Weight status was categorized as underweight (BMI < 18.5), healthy weight (18.5 ≤ BMI < 25), overweight or obese (BMI ≥ 25). HIV transmission route was categorized as injection drug use with or without other route, heterosexual transmission only, and other. Smoking was categorized into no smoking, smoking ≤ 10 cigarettes per day, and smoking > 10 cigarettes per day. Drinking status was classified as no drinking, drinking without binging (< 5 drinks per drinking occasion), and binge drinking (at least 5 drinks per drinking occasion) in the last 30 days [23]. ART regimen was categorized as TDF-based, AZT-based, and other.

Analysis

Each item of the HRQOL questionnaire was rated on a 5-point or 6-point Likert scale with 1 indicating a positive perception and 5 or 6 indicating a negative perception. Scores on these negative items were then reversed so higher scores indicate better HRQOL and values were recoded so that the lowest and highest possible scores were set at 0 and 100 [24]. Responses 1 through 5 were recoded to values of 100, 75, 50, 25, and 0, respectively; responses 1 through 6 were recoded to values of 100, 80, 60, 40, 20 and 0, respectively [24].

Mean and standard deviation were calculated for overall (TC), for physical health composite (PC) and mental health composite (MC), and for each domain at baseline and at each 3-month visit. PC included physical function, role physical, bodily pain, and general health; MC included vitality, social function, role emotional, and mental health.

We categorized the study subjects into two groups: those with poor HRQOL and those with good HRQOL, using the cut-point of 75. Associations between overall HRQOL at baseline and demographic factors and other baseline characteristics were assessed using the Chi-square test.

Mixed effects logistic regression was used to examine changes in HRQOL over time (TC, PC, and MC) and to determine factors associated with the changes in HRQOL during 36 months of ART. A two-level model was constructed with

Table 1 8-item short-form questionnaire

Physical Health					
1. General health: Overall, how would you rate your health during the past 4 weeks?					
Excellent (1)	Very Good (2)	Good (3)	Fair (4)	Poor (5)	Very Poor (6)
2. Physical function: During the past 4 weeks, how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?					
Not at all (1)	Very little (2)	Some-what (3)	Quite a lot (4)	Could not do physical activities (5)	
3. Role physical: During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?					
Not at all (1)	A little bit (2)	Some (3)	Quite a lot (4)	Could not do daily work (5)	
4. Bodily pain: How much bodily pain have you had during the past 4 weeks?					
None (1)	Very mild (2)	Mild (3)	Mod-erate (4)	Severe (5)	Very severe (6)

Mental Health				
1. Role emotional: During the past 4 weeks, how much did personal or emotional problems keep you from doing your usual work, school or other daily activities?				
Not at all (1)	Very little (2)	Some-what (3)	Quite a lot (4)	Could not do daily activities (5)
2. Social function: During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?				
Not at all (1)	Very little (2)	Some-what (3)	Quite a lot (4)	Could not do social activities (5)
3. Emotional wellbeing: During the past 4 weeks, how much have you been bothered by emotional problems (such as feeling anxious, depressed or irritable)?				
Not at all (1)	Slightly (2)	Mod-erately (3)	Quite a lot (4)	Extremely (5)
4. Vitality: During the past 4 weeks, how much energy did you have?				
Very much (1)	Quite a lot (2)	Some (3)	A little (4)	None (5)

repeated HRQOL measures nested within individuals. Interaction between gender and time on HRQOL was examined, as previously reported [25].

All variables of interest were initially included in the multivariate model, and subsequently, insignificant variables were removed using the likelihood ratio test [26]. Covariates previously reported as factors, such as age and gender [27, 28], were retained in the final model regardless of the results of the likelihood ratio test. All analyses were performed using StataMP 18 (Stata Corporation, College Station, TX).

Results

Descriptive Analysis

The median age was 33.4 years (range, 18.5–74.1 years). Most patients (62.8%) were male. Prior exposure to ART was observed in 26 patients (4.1%), while the remaining 95.9% were ART naïve. Injection drug use history was reported by 183 (28.6%). Ninety-three patients (14.6%) had a history of TB infection, 255 (39.9%) had a history of OIs, and 235 (36.8%) tested positive for HCV antibody. The median CD4 cell count was 132 (range: 0–1116 cells/mm^3), and 223 patients (34.9%) were classified as clinical stage IV.

Table 2 presents the associations between baseline demographics, clinical characteristics, and HRQOL groups. On bivariate analysis, good HRQOL at enrollment was associated with female gender ($\chi^2=4.59$, $p=0.032$), younger age ($\chi^2=18.29$, $p<0.001$), higher BMI ($\chi^2=29.71$, $p<0.001$), alcohol use ($\chi^2=12.94$, $p=0.002$), and higher CD4 count ($\chi^2=42.24$, $p<0.001$). In contrast, good HRQOL was inversely associated with food insecurity ($\chi^2=16.35$, $p<0.001$), a history of TB ($\chi^2=15.89$, $p<0.001$), a history of OI ($\chi^2=22.25$, $p<0.001$), HBV and HCV infections ($\chi^2=8.77$, $p=0.033$), advanced clinical stage ($\chi^2=46.85$, $p<0.001$), and TDF based regimen ($\chi^2=30.30$, $p<0.001$). No significant associations were found between HRQOL and education level, transmission route of HIV, smoking, or prior ART treatment. Additionally, there was no difference in HRQOL between the viral load monitoring and standard monitoring arms at baseline.

Table 3 displays the mean scores over time from baseline to 36 months of ART for all domains (8 domains), physical health component (4 domains), mental health component (4 domains), as well as the individual domains of the HRQOL survey. These scores range from 0 to 100 after recoding. Table 4 presents HRQOL over time from baseline to 36 months of ART as the proportion of participants with an HRQOL score≥75 for the overall HRQOL, physical health, and mental health components. Figure 2 illustrates the data presented in Table 4, showing the proportion of participants with a score≥75 for overall HRQOL from baseline to 36 months of ART.

Prior to ART initiation, 57.5% of participants had an overall HRQOL score≥75. This proportion significantly increased after the first three months of ART, rising to 89.0%, and continued to improve gradually until the conclusion of the 36-month follow-up period, reaching 96.4%. At baseline, overall HRQOL was higher in women compared to men. However, throughout the treatment course, the increase in HRQOL seemed to be slower in women compared to men, as illustrated in Fig. 3.

Mixed Effects Logistic Regression

Compared to patients under the age of 25 at baseline, those aged 35 or older appeared to have poorer overall HRQOL (adjusted OR=0.34; 95% CI: 0.17–0.68; z=−3.05; p=0.002) (Table 5). Those who consumed alcohol had better overall HRQOL than non-drinkers: adjusted OR=1.64 (95% CI: 0.97–2.78; z=1.85; p=0.064) for those with 1–4 drinks per drinking occasion, and adjusted OR=2.68 (95% CI: 1.15–6.25; z=2.29; p=0.022) for those with≥5 drinks per drinking occasion. Patients with a higher BMI tended to have better HRQOL. In comparison to those with a BMI<18.5, individuals with a BMI between 18.5 and 24.9 had 1.59 times higher odds of having good overall HRQOL (adjusted OR=1.59; 95% CI: 1.10–2.31; z=2.47; p=0.014), while those with a BMI≥25 had 2.54 times higher odds of having good overall HRQOL (adjusted OR=2.54; 95% CI: 0.99–6.51; z=1.93; p=0.053).

Patients with a history of TB exhibited poorer overall HRQOL compared to those without a history of TB (adjusted OR=1.53; 95% CI: 0.96–2.44; z=1.78; p=0.075). Patients with more advanced clinical stages experienced worse HRQOL. The odds of having good overall HRQOL among patients with clinical stage 2 or higher decreased by about half compared to those with clinical stage 1 (Table 5). Compared with patients on AZT-based regimens, those on TDF-based or other regimens had lower overall HRQOL: adjusted OR=0.56 (95% CI: 0.40–0.80; z=−3.22; p=0.001), adjusted OR=0.14 (95% CI: 0.05–0.40; z=−3.68; p<0.001), respectively. Those who experienced food insecurity had lower overall HRQOL than those who did not (adjusted OR=0.25; 95% CI:0.13–0.48; z=−4.19; p<0.001).

At baseline, women exhibited slightly higher overall HRQOL than men, but the difference was not statistically significant (adjusted OR=1.04; 95% CI: 0.67–1.62; z=0.19; p=0.848). Over time, a significant change in overall HRQOL was observed among both men and women. Among men, with each 3-month period on ART, the likelihood of having good overall HRQOL increased by 42%, or was 1.42 times higher (adjusted OR=1.42; 95% CI: 1.36–1.50; z=13.86; p<0.001). The rate of increase in the overall HRQOL among women was slower compared to that among men. Specifically, over each 3-month period on ART, the likelihood of experiencing good overall HRQOL increased by approximately 11% less for women than men, holding all other variables constant (adjusted OR=0.89; 95% CI: 0.83–0.96; z=−3.07; p=0.002).

When HRQOL was separated into physical health (PC) and mental health (MC) composites, women exhibited significantly higher PC HRQOL than men at baseline (OR=1.76; 95% CI:1.14–2.72; z=2.53; p=0.011). However, there was no significant gender disparity in MC HRQOL at baseline. Despite this baseline distinction, the increase over time in both PC and MC HRQOL followed a similar trend as TC HRQOL, with women showing a slower rate of improvement compared to men. The difference ranged from 10 to 15% for MC and PC, respectively (Table 5).

Discussion

The WHO promotes an integrated person-centered approach to care for PLHIV, acknowledging that HIV treatment goals must go beyond viral suppression [29]. Even when HIV

Table 2 Demographics and baseline clinical characteristics of 639 participants; by overall health-related quality of life (HRQOL)

	Poor HRQOL (<75)	Good HRQOL (≥75)	Test statistic
Total	271 (42.4%)	368 (57.6%)	
Group			
Standard monitoring	133 (44.3%)	167 (55.7%)	$\chi^2=0.86$, p-value = 0.355
Routine viral load monitoring	138 (40.7%)	201 (59.3%)	
Gender			
Male	183 (45.6%)	218 (54.4%)	$\chi^2=4.59$, p-value = 0.032
Female	88 (37.0%)	150 (63.0%)	
Age			
<25	12 (23.5%)	39 (76.5%)	$\chi^2=18.29$, p-value < 0.001
25–<30	39 (31.7%)	84 (68.3%)	
30–<35	97 (45.5%)	116 (54.5%)	
35+	123 (48.8%)	129 (51.2%)	
Years of education			
≤5	24 (57.1%)	18 (42.9%)	$\chi^2=4.57$, p-value = 0.206
6–9	89 (42.6%)	120 (57.4%)	
10–12	108 (39.7%)	164 (60.3%)	
>12	50 (43.1%)	66 (56.9%)	
BMI			
<18.5	121 (56.3%)	94 (43.7%)	$\chi^2=29.71$, p-value < 0.001
≥18.5 but<25	145 (36.7%)	250 (63.3%)	
≥25	5 (17.2%)	24 (82.8%)	
Transmission route of HIV			
Heterosexual	174 (40.3%)	258 (59.7%)	$\chi^2=3.46$, p-value = 0.178
IV drug use	88 (48.1%)	95 (51.9%)	
Other	9 (37.5%)	15 (62.5%)	
Smoking			
No smoking	171 (42.0%)	236 (58.0%)	$\chi^2=0.49$, p-value = 0.783
Smoking≤10 cigarettes/day	64 (44.8%)	79 (55.2%)	
Smoking>10 cigarettes/day	36 (40.4%)	53 (59.6%)	
Alcohol use			
No drinking	232 (45.4%)	279 (54.6%)	$\chi^2=12.94$, p-value = 0.002
Drinking, not binge (<5 drinks/occasion)	32 (36.0%)	57 (64.0%)	
Binge drinking (≥5 drinks/occasion)	7 (18.0%)	32 (82.0%)	
Food insecurity			
No	247 (40.6%)	361 (59.4%)	$\chi^2=16.35$, p-value < 0.001
Yes	24 (77.4%)	7 (22.6%)	
Prior TB diagnosis			
Yes	57 (61.3%)	36 (38.7%)	$\chi^2=15.89$, p-value < 0.001
No	214 (39.2%)	332 (60.8%)	
TB treatment status			
Currently under TB treatment	46 (64.8%)	25 (35.2%)	$\chi^2=19.03$, p-value < 0.001
Completed treatment	5 (41.7%)	7 (58.3%)	
Unknown	6 (66.7%)	3 (33.3%)	
N/A	214 (39.2%)	332 (60.8%)	
Ever diagnosed with an OI			
Yes	137 (53.7%)	118 (46.3%)	$\chi^2=22.25$, p-value < 0.001
No	134 (34.9%)	250 (65.1%)	
Clinical stage at enrollment			
I	87 (29.1%)	212 (70.9%)	$\chi^2=46.85$, p-value < 0.001
II	19 (39.6%)	29 (60.4%)	
III	35 (50.7%)	34 (49.3%)	
IV	130 (58.3%)	93 (41.7%)	
CD4 at enrollment			

Table 2 (continued)

	Poor HRQOL (<75)	Good HRQOL (≥75)	Test statistic
≤100	164 (55.8%)	130 (44.2%)	$\chi^2 = 42.24$, p-value < 0.001
101–250	51 (35.9%)	91 (64.1%)	
>250	56 (27.5%)	147 (72.4%)	
Ever had prior ART			
Yes	9 (34.6%)	17 (65.4%)	$\chi^2 = 0.67$, p-value = 0.412
No	262 (42.7%)	351 (57.3%)	
Hepatitis			
No HBV or HCV	136 (37.7%)	225 (62.3%)	$\chi^2 = 8.77$, p-value = 0.033
HBV only	24 (55.8%)	19 (44.2%)	
HCV only	91 (46.9%)	103 (53.1%)	
HBV and HCV	20 (48.8%)	21 (51.2%)	
Baseline ART regimen			
AZT based regimen	79 (29.7%)	187 (70.3%)	$\chi^2 = 30.30$, p-value < 0.001
TDF based regimen	186 (51.7%)	174 (48.3%)	
Other	6 (46.2%)	7 (53.8%)	

The percentages in each row sum up to 100

BMI body mass index, *TB* tuberculosis, *OI* opportunistic infection, *ART* antiretroviral therapy, *HBV* hepatitis B virus, *HCV* hepatitis C virus, *AZT* zidovudine, *TDF* tenofovir disoproxil fumarate

viral suppression is achieved, many PLHIV face additional challenges, including non-communicable conditions, mental health issues, social isolation and stigma and discrimination, all of which can affect quality of life [3, 12, 30]. In recognition of these challenges, some experts have called for the inclusion of HRQOL as a key program goal alongside the 95-95-95 testing and treatment targets [3, 5]. Recently, WHO included HRQOL as an "additional key outcome" in their latest HIV health sector strategy [29].

Our study found that nearly half of PLHIV initiating ART reported low HRQOL (overall HRQOL score < 75) at baseline prior to starting ART. However, after beginning on ART, HRQOL increased rapidly and 89.0% of PLHIV reported good HRQOL after three months of ART. Thereafter, there was continued gradual improvement throughout the 36-month follow-up period and 96.4% of participants had good HRQOL by the end of the study. Previous studies have shown that HRQOL is significantly higher among PLHIV on ART and that HRQOL increases with continued ART use [31–33]. In a study involving 880 PLHIV in Togo, those on ART were about 7 times more likely to have a good overall quality of life (OR = 6.99, 96% CI: 4.11–11.9) [33]. Longitudinal studies have consistently reported the same trend [34–36]. Studies that enrolled PLHIV initiating ART or those already on ART for six months or less found a significant increase in HRQOL during follow-up, occurring approximately 10 months after baseline [34], or at 18 months for those still on ART [35].

There have been previous studies of HRQOL among PLHIV in Vietnam, but no previous study used the SF-8 tool to measure HRQOL, limiting direct comparison with our results [12, 37]. One study used the EuroQol-5 dimensions-5 levels (EQ-5D-5L) instrument and found an association between change in HRQOL and ART adherence [37]. Another study used the WHO Quality of Life-HIV Brief Instrument (WHOQoL-HIV-BREF) to examine the relationship between HIV-related stigma and QOL among PLHIV initiating ART [12]. Comparing the levels of QOL across studies is challenging when measurement tools are not consistent.

Globally, there is not a universally accepted tool for assessing HRQOL among PLHIV. A number of tools have been used and validated in different settings with the WHOQoL-HIV-BREF, the Medical Outcomes Study HIV Health Survey (MOS-HIV), the Multidimensional Quality of Life Questionnaire for Persons with HIV/AIDS (MQoL-HIV), the EQ-5D-5L, and the SF-8 (or SF-36) most commonly employed [38]. However, these existing measures may not be completely relevant to the current needs of PLHIV, and there is no consensus as to which domains constitute HRQOL [39]. If HRQOL is to be included as a major goal in HIV programs, its measurement should be standardized and validated, at least at the national level. Australia is one of the first countries to include HRQOL as a target in a national HIV program, aiming for 75% of PLHIV to have good HRQOL [40]. To measure and monitor HRQOL a new tool was developed and validated using a community participatory approach [39, 41]. Similar efforts may be needed in Vietnam and other countries to develop relevant and standardized tools for use at the national level to monitor and improve HRQOL.

Our data found differences in HRQOL across genders. Prior to ART, women in our study reported significantly higher physical health composite (PC) scores than men

Table 3 Means (std) of health-related quality of life scores over time for overall, physical, and mental health composites, and each domain

	TC	PC	MC	GH	PF	RP	BP	VT	SF	MH	RE
Baseline (n = 639)	73.3 (17.5)	75.6 (18.3)	71.0 (18.6)	54.5 (16.6)	80.5 (24.9)	80.4 (25.8)	87.1 (19.4)	46.4 (25.7)	81.4 (23.0)	74.8 (25.0)	81.3 (23.8)
3 m (n = 356)	84.9 (10.2)	85.2 (10.0)	84.5 (11.5)	53.5 (12.9)	96.1 (11.8)	96.3 (12.5)	95.0 (13.2)	61.5 (18.4)	96.1 (12.7)	84.7 (20.1)	95.8 (12.6)
6 m (n = 492)	86.6 (8.7)	86.4 (8.8)	86.7 (9.9)	54.4 (10.7)	97.1 (10.8)	97.5 (10.3)	96.7 (10.6)	65.4 (16.1)	97.7 (9.6)	85.8 (19.9)	97.8 (8.8)
9 m (n = 389)	87.1 (7.5)	87.0 (6.9)	87.2 (8.9)	53.4 (10.7)	98.5 (7.7)	98.5 (7.8)	97.4 (8.7)	65.5 (16.4)	98.3 (8.7)	86.6 (18.5)	98.5 (7.6)
12 m (n = 504)	86.8 (8.8)	86.6 (8.5)	87.0 (10.0)	54.2 (10.3)	97.0 (10.9)	97.5 (10.2)	97.7 (7.9)	66.2 (15.4)	97.4 (10.0)	86.4 (18.5)	97.8 (9.5)
15 m (n = 417)	87.5 (8.2)	87.4 (7.5)	87.6 (9.6)	55.8 (9.0)	98.0 (8.8)	98.1 (8.6)	97.8 (8.7)	69.5 (13.1)	97.9 (9.0)	85.0 (19.2)	97.9 (8.5)
18 m (n = 464)	88.5 (7.6)	88.1 (7.3)	88.8 (8.5)	57.8 (7.2)	97.9 (9.1)	98.0 (9.1)	98.8 (6.6)	72.2 (10.1)	98.0 (8.5)	86.6 (17.8)	98.4 (7.8)
21 m (n = 343)	88.0 (8.2)	87.6 (7.8)	88.3 (9.2)	57.7 (7.1)	97.3 (9.5)	97.7 (8.9)	97.9 (8.5)	71.6 (10.5)	97.6 (9.5)	86.0 (17.9)	98.0 (8.7)
24 m (n = 448)	88.4 (7.6)	88.0 (7.6)	88.8 (8.4)	57.7 (7.2)	98.1 (8.5)	98.3 (8.3)	98.0 (9.3)	71.8 (10.2)	98.4 (8.5)	86.6 (17.7)	98.3 (8.0)
27 m (n = 314)	88.4 (7.7)	88.2 (7.2)	88.6 (8.8)	58.2 (7.4)	97.9 (9.2)	98.3 (8.2)	98.7 (6.6)	72.1 (9.8)	97.9 (9.1)	86.1 (17.3)	98.0 (9.0)
30 m (n = 399)	88.6 (6.6)	88.3 (6.3)	89.0 (7.6)	58.3 (5.8)	98.0 (8.3)	98.2 (7.7)	98.7 (6.4)	72.6 (7.8)	98.1 (7.6)	87.0 (16.3)	98.2 (7.4)
33 m (n = 276)	88.2 (7.9)	87.8 (8.1)	88.5 (8.3)	58.2 (6.5)	97.6 (9.6)	97.6 (9.3)	97.8 (8.4)	72.0 (9.4)	97.8 (8.8)	86.1 (16.2)	98.2 (7.5)
36 m (n = 362)	89.5 (4.8)	88.9 (4.8)	90.0 (5.7)	59.0 (5.4)	98.6 (7.1)	99.0 (5.2)	99.1 (5.0)	73.3 (6.8)	98.8 (5.9)	88.7 (14.5)	99.2 (4.9)

and slightly lower mental health composite (MC) scores, but the difference in MC scores was not statistically significant. Despite the differences at baseline, the increase in both PC and MC over time on ART was significantly slower in women than in men. A study in the US among an HIV-negative, chronically ill, and low-income population similarly found higher PC and lower MC scores in women compared to men [20]. Other studies using different quality of life measures show mixed findings [42, 43]. For example, a study in Tanzania involving 912 PLHIV found that mean HRQOL scores were significantly higher for women compared to men, with women scoring 5.1 points higher in overall function and 4.3 points higher in life satisfaction [43]. However, another study using the same tool (HIV/AIDS-Targeted Quality of Life (HAT-QoL)) reported no difference in HRQOL across genders [42]. The effect of gender on QOL may depend on a variety of factors, including the population studied and the specific cultural context. HIV disclosure concerns and rates of internalized, anticipated, and enacted stigma may differ by gender, which in turn may affect quality of life. Our study showed a small difference in the change in HRQOL over time by gender (10–16% for PC, MC and overall HRQOL). While this difference was statistically significant, it is unclear whether the difference is clinically meaningful. Nevertheless, monitoring HRQOL across genders as well as other population characteristics is important to identify and address health disparities [9].

Our study also found a relationship between HRQOL and age. Individuals aged 35 or older had poorer overall HRQOL compared to those under 25 (adjusted OR = 0.34, 95% CI: 0.17–0.68). Globally, increased access to care and improved tolerability of ART have extended the lifespan of PLHIV, resulting in a greater proportion reaching older ages [44, 45]. Vietnam is no exception to this trend. Data collected from PLHIV receiving care in 7 countries in Asia participating in the TREAT Asia HIV Observational Database Low Intensity Transfer (TAHOD-LITE) showed that the percentage of patients aged 50 or older increased from 2.4% in 2000 to 18% in 2013. The authors predict that this figure will rise to 32% by 2025 [44].

In line with WHO's QOL conceptual framework, our results demonstrate how clinical variables (such as TB history and WHO clinical stage), physiological variables (such as BMI), and psychosocial variables (such as food insecurity) collectively influence HRQOL outcomes. Our data highlight the need for addressing these multi-level determinants through integrated person-centered care systems designed to address not only the specific medical needs of HIV but also the multifaceted issues associated with aging [46, 47].

Our study assessed QOL among individuals living with HIV using a tool that has been previously validated and

Table 4 Percentage (95% CI) of good health-related quality of life over time (mean scores ≥ 75) for overall, physical, and mental health composites

	Overall (TC-8 items)	Physical health (PC-4 items)	Mental health (MC-4 items)
Baseline (n = 639)	57.5 (53.6–61.3)	60.0 (56.1–63.7)	59.0 (55.1–62.8)
3 m (n = 356)	89.0 (85.3–91.9)	90.7 (87.2–93.3)	88.5 (84.7–91.4)
6 m (n = 492)	93.5 (90.9–95.4)	92.9 (90.2–94.9)	93.5 (90.9–95.4)
9 m (n = 389)	95.6 (93.1–97.3)	95.9 (93.4–97.5)	95.1 (92.5–96.9)
12 m (n = 504)	92.5 (89.8–94.5)	92.5 (89.8–94.5)	93.3 (90.7–95.1)
15 m (n = 417)	94.2 (91.6–96.1)	94.2 (91.6–96.1)	94.0 (91.3–95.9)
18 m (n = 464)	94.2 (91.6–96.0)	94.2 (91.6–96.0)	95.7 (93.4–97.2)
21 m (n = 343)	93.3 (90.1–95.5)	92.7 (89.4–95.0)	95.0 (92.2–96.9)
24 m (n = 448)	95.3 (92.9–96.9)	94.6 (92.1–96.4)	96.0 (93.7–97.5)
27 m (n = 314)	94.9 (91.8–96.9)	95.5 (92.6–97.3)	95.5 (92.6–97.3)
30 m (n = 399)	94.7 (92.1–96.5)	94.7 (92.1–96.5)	95.0 (92.4–96.7)
33 m (n = 276)	92.8 (89.0–95.3)	92.8 (89.0–95.3)	94.6 (91.2–96.7)
36 m (n = 362)	96.4 (93.9–97.9)	96.1 (93.6–97.7)	97.5 (95.3–98.7)

TC total quality of life scores, *PC* physical health component, *MC* mental health component, *m* months

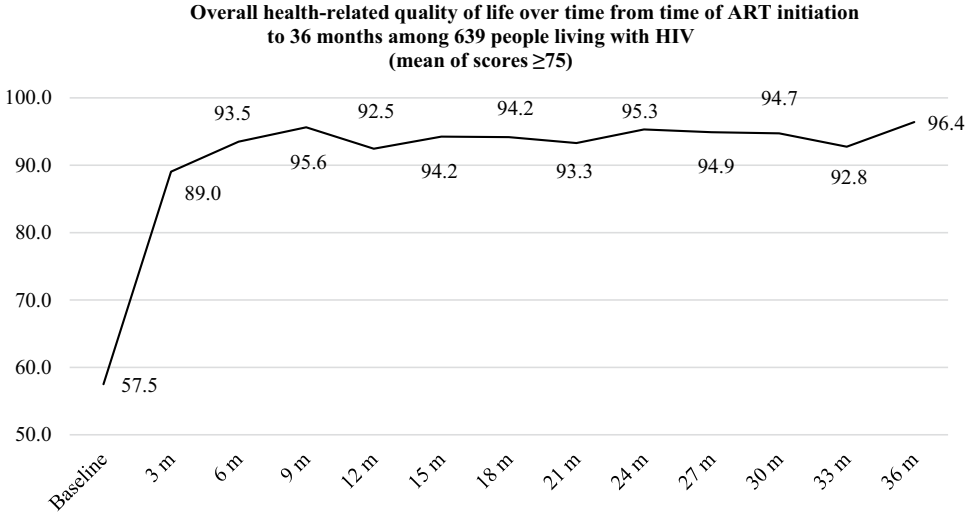

Fig. 2 Overall health-related quality of life over time from time of ART initiation to 36 months among 639 people living with HIV (mean of scores ≥ 75)

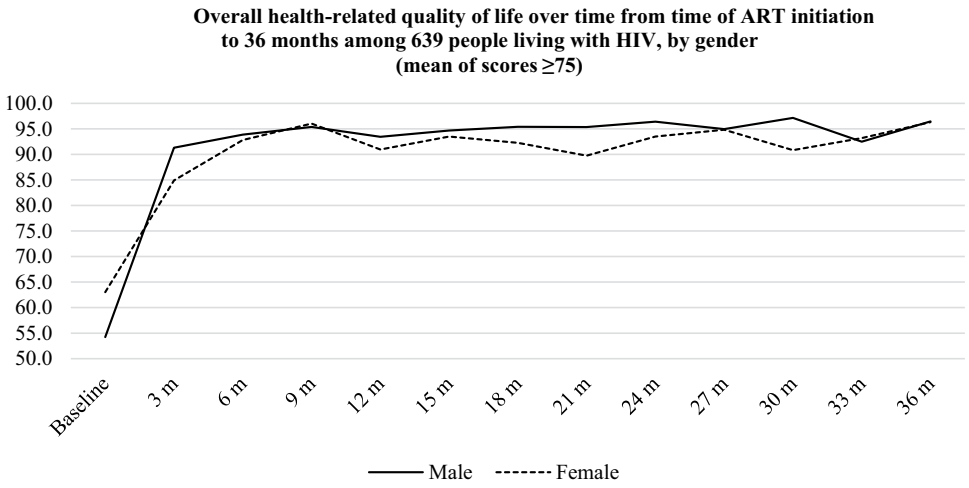

Fig. 3 Overall health-related quality of life over time from time of ART initiation to 36 months among 639 people living with HIV, by gender (mean of scores ≥ 75)

widely applied in this population. Although commonly used in HIV research, the instrument was originally developed to measure domains commonly affected by illness and treatment in general, reflecting broader aspects of health-related quality of life. Therefore, our findings may also be applicable to other health conditions that share similar characteristics with HIV, such as chronicity, stigma, and the need for long-term care.

Table 5 Factors associated with health-related quality of life among 639 people living with HIV initiating antiretroviral therapy

	TC			PC			MC		
	OR (95% CI)	Z-value	p-value	OR (95% CI)	Z-value	p-value	OR (95% CI)	Z-value	p-value
Time	1.42 (1.36–1.50)	13.86	<0.001	1.41 (1.34–1.48)	14.03	<0.001	1.47 (1.39–1.55)	13.93	<0.001
Time*Gender	0.89 (0.83–0.96)	−3.07	0.002	0.84 (0.79–0.90)	−4.8	<0.001	0.90 (0.83–0.97)	−2.72	0.006
Gender									
Male	Referent			Referent			Referent		
Female	1.04 (0.67–1.62)	0.19	0.848	1.76 (1.14–2.72)	2.53	0.011	0.89 (0.58–1.36)	−0.55	0.582
Age									
<25	Referent			Referent			Referent		
25–<30	0.94 (0.44–1.99)	−0.17	0.867	0.88 (0.42–1.83)	−0.35	0.724	1.01 (0.49–2.06)	0.02	0.982
30–<35	0.55 (0.27–1.12)	−1.64	0.101	0.56 (0.28–1.12)	−1.64	0.102	0.64 (0.32–1.25)	−1.32	0.187
35+	0.34 (0.17–0.68)	−3.05	0.002	0.34 (0.17–0.68)	−3.07	0.002	0.41 (0.21–0.80)	−2.63	0.009
Drinking									
No drinking	Referent			Referent			Referent		
Drinking, not binge	1.64 (0.97–2.78)	1.85	0.064	2.05 (1.22–3.45)	2.71	0.007	1.59 (0.94–2.66)	1.74	0.082
Binge drinking	2.68 (1.15–6.24)	2.29	0.022	1.94 (0.91–4.14)	1.72	0.086	2.15 (0.97–4.79)	1.87	0.061
BMI									
<18.5	Referent			Referent			Referent		
≥18.5 but<25	1.59 (1.10–2.31)	2.47	0.014	1.59 (1.12–2.27)	2.56	0.010	1.42 (0.98–2.04)	1.88	0.060
≥25	2.54 (0.99–6.51)	1.93	0.053	2.80 (1.12–7.01)	2.19	0.028	2.03 (0.84–4.90)	1.56	0.118
History of TB									
Yes	Referent			Referent			Referent		
No	1.53 (0.96–2.44)	1.78	0.075	1.50 (0.96–2.34)	1.8	0.072	1.54 (0.97–2.45)	1.82	0.068
Clinical stage at enrollment									
1	Referent			Referent			Referent		
2	0.52 (0.28–0.97)	−2.05	0.041	0.67 (0.36–1.24)	−1.28	0.202	0.55 (0.30–1.03)	−1.88	0.060
3	0.60 (0.34–1.04)	−1.81	0.070	0.64 (0.38–1.10)	−1.62	0.106	0.63 (0.36–1.08)	−1.69	0.092
4	0.62 (0.41–0.95)	−2.21	0.027	0.62 (0.41–0.93)	−2.31	0.021	0.72 (0.47–1.09)	−1.56	0.120
ART regimen at enrollment									
AZT	Referent			Referent			Referent		
TDF	0.56 (0.40–0.80)	−3.22	0.001	0.53 (0.38–0.74)	−3.73	<0.001	0.64 (0.46–0.90)	−2.56	0.01
Other	0.14 (0.05–0.40)	−3.68	<0.001	0.14 (0.05–0.37)	−3.93	<0.001	0.28 (0.10–0.80)	−2.38	0.017
Food insecurity									
No	Referent			Referent			Referent		
Yes	0.25 (0.13–0.48)	−4.19	<0.001	0.27 (0.14–0.50)	−4.13	<0.001	0.25 (0.13–0.48)	−4.23	<0.001

BMI body mass index, *TB* tuberculosis, *ART* antiretroviral therapy, *AZT* zidovudine, *TDF* tenofovir disoproxil fumarate

This study has several limitations that should be acknowledged. Firstly, the use of the SF-8 tool, while validated in multiple similar settings, has not been validated among PLHIV in Vietnam and may not fully capture the complexities of HRQOL among PLHIV in the Vietnamese context. The absence of a universally accepted HRQOL measurement tool for PLHIV complicates direct comparisons with other studies. In addition, while this abbreviated tool is widely used and offers a practical, time-efficient option for routine assessment, it does not provide a comprehensive or fully adequate evaluation of quality of life as defined by the WHO's conceptual framework. Despite these limitations, its ease of use and feasibility make it a valuable alternative, particularly when compared to longer tools that, while capturing more dimensions, often suffer from missing data and low completion rates. Overall, it remains a practical instrument that offers reasonable data coverage.

Second, our study was conducted at a single center within a national-level hospital. Study participants may differ in some ways compared to those receiving treatment elsewhere in Vietnam, and the quality of care provided at this center may also differ from other centers, which could affect the quality of life of those receiving care. Third, the self-reported nature of HRQOL assessments introduces potential bias, as participants may overestimate or underestimate their health status. However, as discussed above, quality of life is inherently subjective, and there is no gold standard for measuring it. Our longitudinal study design, an important strength of the study, allowed us to capture changes and interactions over time with a consistent measurement approach. Unlike many other studies on HRQOL among PLHIV, we were able to measure key factors (CD4 count, clinical stage, and other clinical characteristics) well-known to be associated with HRQOL and adjusted for them.

However, while we accounted for several covariates, residual confounding may still exist, affecting the interpretation of the associations observed.

Conclusions

In conclusion, this longitudinal study on HRQOL among PLHIV in Vietnam over a three-year period revealed significant improvements in both physical and mental health domains following the initiation of ART. Despite a promising overall increase in HRQOL, disparities persisted, particularly in gender and age groups, with women experiencing slower improvements over time. These findings underscore the necessity of a more nuanced, person-centered approach in HIV care that goes beyond viral suppression to address social determinants, mental health, and stigma. Standardizing HRQOL measurements and incorporating them into national HIV programs could be pivotal in enhancing the comprehensive care and wellbeing of PLHIV. Future efforts should aim to develop culturally relevant tools and strategies to monitor and improve HRQOL, ensuring that the gains in HIV treatment translate into meaningful improvements in quality of life for all individuals living with HIV.

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Declarations

Competing Interests TMP receives funding from Gilead Sciences through a grant to Beth Israel Deaconess Medical Center (Boston, MA, USA) and has received travel support from Gilead Sciences. HTD, CDD, and DJC report no competing interests.

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