



# Health-Related Quality of Life of HIV Positive Patients with Hypertension: Is There an Association with Blood Pressure Control?

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## Abstract

**Introduction** The presence of comorbidities could affect the health-related quality of life (HRQoL) of people living with HIV (PLHIV).

**Aim** To assess the HRQoL of PLHIV and Hypertension, as well as its association with blood pressure (BP) control.

**Methods** This cross-sectional study was conducted in the HIV clinic of the University of Uyo Teaching Hospital in Akwa Ibom State, Nigeria, between August and October 2018. The EQ-5D-5L was administered to 201 eligible outpatients in the waiting area of the clinic before consulting the physician. Patients' socio-demographic and clinical data were obtained from the medical records. Blood pressure was measured using an automatic BP monitor. Data were analyzed with SPSS version 20.0.

**Results** Majority (58.6%) of the respondents were females; mean age was  $49.59 \pm 8.97$  years; mean systolic and diastolic BP were  $152.77 \pm 19.38$  mmHg and  $90.28 \pm 11.33$  mmHg, respectively. EQ-VAS and EQ-5D index scores were  $80.99 \pm 15.97$  and  $0.86 \pm 0.05$ , respectively. There were no significant differences in EQ-VAS score ( $z = -0.113$ ,  $p = 0.910$ ) or EQ-5D utility ( $z = -0.523$ ,  $p = 0.601$ ) between participants with controlled and uncontrolled BP. Duration on antihypertensive drugs was associated with EQ-VAS score ( $\chi^2(2) = 6.558$ ,  $p = 0.038$ ), while employment status was associated with EQ-5D utility ( $z = -2.661$ ,  $p = 0.008$ ).

**Conclusions** PLHIV and hypertension accessing care at a Nigerian hospital reported a high HRQoL, irrespective of BP control status. Nevertheless, there is a need to provide psychological support and employment for this population to maximise their HRQoL.

**Keywords** Comorbidity · EQ-5D-5L · Health-related quality of life · HIV · Hypertension

## 1 Introduction

Nigeria is one of the countries with the highest HIV burden in the world [1]. It is one of the three countries accounting for about 60% of new HIV infections and 54% of AIDS-related deaths each year [2]. According to the 2018 Nigeria

HIV/AIDS Indicator and Impact Survey (NAIIS), the nationwide prevalence of HIV/AIDS in people aged 15–64 years is 1.5% [3].

The use of more effective and safer antiretroviral drugs (ARDs) has been linked to increased longevity in HIV patients [4]. As a result, the incidence and prevalence of chronic disorders including hypertension in PLHIV has increased. Both HIV infection and hypertension require daily and lifelong pharmacological therapy, as well as lifestyle adjustments, to keep the conditions under control. As a result, having both illnesses coexist might have a significant psychological impact on the patient. Health-related quality of life (HRQoL) is defined as how well an individual functions in their life as well as their perceived well-being in physical, mental and social health domains [5]. These domains are usually affected by the presence of disease or

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treatment. The HRQoL of PLHIV is an important indicator of the effectiveness of HIV/AIDS treatment and care programmes as reported by the patient [6]. Such assessments can also be useful in identifying factors associated with HRQoL among PLHIV. This will, in turn, inform public health decisions on specific interventions that could possibly improve their HRQoL [7, 8].

Instruments for measuring HRQoL are generally classified as specific (with respect to the disease, population of patients, functional area or problem), and generic [9]. Disease-specific instruments are designed to provide detailed information about the impacts of a particular disease state on the patient's health. Generic instruments on the other hand, apply to a variety of populations or health conditions; they can capture comorbidities, and permit broad comparisons of the relative impact of various health care interventions [10, 11]. Generic instruments include health profiles (which generate scores in a variety of health domains) and utility measures [9, 10]. Utility measures summarize HRQoL as a single number (utility score) measured on a scale ranging from 0.0 (death) to 1.0 (full health), although negative scores (worse than death) are possible [9]. Utility scores are typically derived from a description of a health state by a patient using generic instruments such as the EQ-5D family of instruments. The description is then 'valued' using a pre-existing, country-specific set of values (preference weights) derived from valuation studies among a representative sample of the general population [12]. Utilities generated from preference-based measures, such as the 5-level version of the EQ-5D (EQ-5D-5L), in combination with survival estimates can be used to generate quality adjusted life years (QALYs). QALY is a summary measure of health outcomes representing net impact of treatment on duration and quality of life [9]; it is used in economic evaluations of healthcare as a basis for resource allocation [13] and a justification for allocated resources [9]. In Nigeria, HIV care and treatment is largely funded by foreign donor agencies. Even so, the burden of the disease on the economy is huge [14]. Additionally, the presence of comorbidities has an impact on the HRQoL of PLHIV [15]. Hence, assessing the HRQoL of HIV positive people with hypertension—a non-communicable condition that is common among PLHIV [16, 17]—is important. The use of a preference-based measure for such assessment will facilitate future economic evaluations of healthcare interventions in hypertensive PLHIV. Apart from generating utilities that can be easily incorporated in such economic evaluations, the EQ-5D-5L is brief, easy to administer and interpret, and is available in several languages. To date, no study has reported the HRQoL of PLHIV and hypertension with the EQ-5D-5L, nor reported the effect of blood pressure (BP) control on the HRQoL of this population. Hence, this study sought to evaluate the HRQoL of HIV positive patients with hypertension in a

Nigerian hospital, as well as its association with BP control. In addition, the study assessed the association of HRQoL with other patient variables.

## 2 Methods

### 2.1 Design, Setting and Participants

This was a cross-sectional study conducted in the HIV clinic of the University of Uyo Teaching hospital (UUTH), Uyo, Akwa Ibom State, Nigeria. UUTH is Akwa Ibom State's main referral hospital, with a capacity of 500 beds. At the time of data collection, the hospital had about 4300 registered PLHIV on antiretroviral therapy. The HIV clinic of the hospital generally manages PLHIV with or without hypertension. However, hypertensive PLHIV with persistently poor BP control are referred to the Medical Outpatient Department for expert management. Patients were eligible to participate in the study if they were 18 years or older, had established diagnoses of HIV infection and hypertension, had been taking medications for both conditions for at least 3 months, and gave informed consent to participate. Pregnant women and those with altered mental status were excluded from the study. Given an estimated population of 272 PLHIV and hypertension in the study setting at the time of data collection, the minimum sample size for the study was calculated to be 160 using a 95% confidence level, and a 5% margin of error. The sample size was computed using an online Raosoft sample size calculator. However, 220 patients were targeted for the study to increase the statistical power of the analysis.

### 2.2 Outcome Measures

The primary outcome measure was HRQoL of hypertensive PLHIV. Secondary outcome measures were BP control, and the association between HRQoL and BP control. Because of the coexistence of HIV infection and the increased vulnerability to metabolic abnormalities and renal disease in this population, BP control was defined as values < 140/90 mmHg. This is consistent with the Eight Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC 8) which recommends a goal BP of < 140/90 mmHg in hypertensive adults with diabetes or chronic kidney disease [18].

### 2.3 Study Instruments

The EQ-5D-5L is a generic instrument developed by the European Quality of Life (EuroQol) Group to measure health status in the general population and in different disease conditions. It is a 2-part instrument consisting of a

descriptive system and a visual analogue scale (EQ-VAS). The descriptive system comprises 5 dimensions of health viz.: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. For each dimension, there are 5 levels: level 1 (no problems), level 2 (slight problems), level 3 (moderate problems), level 4 (severe problems), and level 5 (extreme problems). The respondent is required to select the level that appropriately describes their state regarding each health dimension. These digits (which indicate the level of severity for each dimension) can be combined in a 5-digit number which describes the health state of the respondent. Hence, a total of  $5^5$  (i.e. 3 125) unique health states exist for this measure. These health states can be ‘valued’ or converted into single index values (utilities) using preference-based, country-specific value sets [19]. The EQ-VAS allows the respondent to rate their current overall health (by placing an ‘X’ on a 20 cm vertical visual analogue scale, with 0 indicating the worst health and 100 the best health imaginable. The instrument also requires the respondent to write the number marked on the scale in a box beside the EQ-VAS.

Blood pressure of participants was measured by a nurse with a validated automatic upper arm BP monitor (Omron M3; Omron Healthcare Co., Ltd.). The average of two close readings taken on the left upper arm while the participant sat still was recorded as participant’s BP.

## 2.4 Data Collection

On each clinic day, a nurse took the patients’ BP in the HIV clinic waiting room, following which the principal investigator presented the study objectives to them. Thereafter, copies of the EQ-5D-5L for Nigeria (English) v1.0 (Online Appendix I) were distributed to eligible outpatients prior to seeing the physician. The participants were chosen by convenience sampling. After completion in the clinic, the self-completed questionnaires were returned to the investigators or one of the two research assistants. In addition, patients’ socio-demographic and clinical data were obtained from the medical records. Data collection was done between August and October 2018.

Approval to conduct this study was obtained from the Health Research Ethical Committee of UUTH (UUTH/AD/S/96/VOLXXI/188). Written informed consent to participate was obtained from all participants included in the study after assuring them of anonymity, confidentiality and voluntariness of participation.

## 2.5 Data Analysis

Data were analyzed using the IBM SPSS Statistics for Windows, version 20.0 (IBM Corp. Armonk, NY). Descriptive statistics (frequency, percent, mean, standard deviation) were used to present participants’ socio-demographic

and clinical data as well as the EQ-5D-5L health profiles, EQ-VAS and EQ-5D utility. Non-parametric tests (Mann–Whitney U and Kruskal Wallis) were used to evaluate the relationship between patient socio-demographic and clinical variables and health status. Due to the low number of reported problems in this study, the EQ-5D-5L levels were dichotomized into ‘no problems’ (level 1) and ‘problems’ (levels 2–5) as recommended [19]. The EQ-5D-5L crosswalk value sets for Zimbabwe [20] were used for valuation of participants’ health states since there were no value sets for Nigeria at the time of writing this manuscript. The Zimbabwean value sets were used because the health status of the Zimbabwean general population is comparable with that of the Nigerian general population. Missing values were managed with case-wise deletion. The level of significance for all analyses was set at  $p < 0.05$ .

## 3 Results

Out of the 220 eligible patients approached, 201 agreed to participate giving a response rate of 91.4%. Reasons given for refusal to participate include lack of interest, lack of time, inability to read, etc. Due to inaccuracies and missing data, 10 questionnaires were discarded. Hence, data from 191 respondents were used for analysis.

Females constituted the majority (58.6%) of our respondents; mean age was  $49.59 \pm 8.97$  years. Mean duration (in years) on drugs for HIV infection and hypertension were  $9.04 \pm 3.82$  and  $3.23 \pm 3.54$  respectively. Forty two (22.0%) had controlled BP, while the majority (75.9%) had undetected viral load. Twenty-five (13.1%) had other illnesses in addition to HIV infection and hypertension. Detailed description of patient socio-demographic and clinical characteristics is given in Table 1.

Table 2 indicates the health status indices for the total sample as well as the values stratified by age. Mean EQ-VAS and EQ-5D utility scores for the study sample were  $80.99 \pm 15.97$  and  $0.86 \pm 0.05$  respectively. Table 3 shows the distribution of patients’ health profiles by age group. The most frequently reported ‘problems’ were in the pain/discomfort (33.0%) and anxiety/depression (34.0%) dimensions. Table 4 reports the association of patients’ variables with HRQoL. Mann–Whitney U test indicated that there were no significant differences between participants with controlled BP and those with uncontrolled BP with respect to EQ-VAS score ( $z = -0.113, p = 0.910$ ) and EQ-5D utility score ( $z = -0.523, p = 0.601$ ). Duration on antihypertensive drugs was associated with EQ-VAS score ( $\chi^2(2) = 6.558, p = 0.038$ ), while current employment status was associated with EQ-5D utility score ( $z = -2.661, p = 0.008$ ).

**Table 1** Patient socio-demographic and clinical variables (N = 191)

Variable	Frequency	Percent
<b>Gender</b>		
Male	79	41.4
Female	112	58.6
<b>Age (years)</b>		
< 40	24	12.6
40–49	71	37.2
50–59	65	34.0
≥ 60	31	16.2
<i>Mean ± SD</i>	49.59 ± 8.97	
<b>Education</b>		
None	5	2.6
Primary	50	26.2
Secondary	76	39.8
Tertiary	60	31.4
<b>Marital status</b>		
Single	14	7.3
Married	115	60.2
Widowed	51	26.7
Divorced	11	5.8
<b>Current employment status</b>		
Working	113	59.2
Not working	78	40.8
<b>Blood pressure</b>		
Controlled (< 140/90 mmHg)	42	22.0
Not controlled (≥ 140/90 mmHg)	149	78.0
<b>Viral load</b>		
Undetected (< 40 copies/mL)	145	75.9
Detected (≥ 40 copies/mL)	46	24.1
<b>Other illness</b>		
Diabetes mellitus	8	4.2
Peptic ulcer disease	3	1.6
Osteoarthritis	6	3.1
Haemorrhoids	3	1.6
Benign prostatic hyperplasia	5	2.6
<i>Total</i>	25	13.1
	Mean	SD
Length of time on antiretroviral drugs (years)	9.04	3.82
Length of time on antihypertensive drugs (years)	3.23	3.54
Systolic blood pressure	152.77	19.38
Diastolic blood pressure	90.28	11.33

*SD* standard deviation

## 4 Discussion

To our knowledge, this is the first study assessing the HRQoL of HIV positive patients with hypertension using the EQ-5D-5L, and examining the effect of BP control and other patient variables on their HRQoL. The EQ-VAS score

as well as the EQ-5D utility in the present study were high, suggesting a high HRQoL of our study population. BP control was observed in a minority of participants. HRQoL was not associated with BP control. The most frequently reported problems were in the pain/discomfort and anxiety/depression dimensions of the EQ-5D-5L. Duration on

**Table 2** Health status indices of HIV positive patients with hypertension stratified by age

Health status index	Age (years)				Total
	< 40	40–49	50–59	≥ 60	
<b>EQ-VAS score</b>					
Mean (SD)	86.04 (13.99)	80.51 (15.58)	79.86 (17.30)	80.58 (15.40)	80.99 (15.97)
Median	87.50	80.00	80.00	80.00	80.00
25th percentile	76.25	70.00	67.50	70.00	70.00
75th percentile	100.00	95.00	95.00	90.00	95.00
<b>EQ-5D utility</b>					
Mean (SD)	0.86 (0.05)	0.86 (0.05)	0.85 (0.06)	0.85 (0.06)	0.86 (0.05)
Median	0.90	0.90	0.85	0.86	0.86
25th percentile	0.82	0.85	0.81	0.83	0.81
75th percentile	0.90	0.90	0.90	0.90	0.90

EQ-VAS EuroQol visual analogue scale, SD standard deviation

**Table 3** Description of health profiles by age group

Dimension	Age group (years), n (%)				Total
	< 40	40–49	50–59	≥ 60	
<b>Mobility</b>					
No problems	24 (12.6)	66 (34.6)	56 (29.3)	27 (14.1)	173 (90.6)
Problems	0 (0.0)	5 (2.6)	9 (4.7)	4 (2.1)	18 (9.4)
<b>Self-care</b>					
No problems	24 (12.6)	71 (37.2)	65 (34.0)	30 (15.7)	190 (99.5)
Problems	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	1 (0.5)
<b>Usual activities</b>					
No problems	24 (12.6)	67 (35.1)	59 (30.9)	27 (14.1)	177 (92.7)
Problems	0 (0.0)	4 (2.1)	6 (3.1)	4 (2.1)	14 (7.3)
<b>Pain/discomfort</b>					
No problems	17 (8.9)	53 (27.7)	35 (18.3)	23 (12.0)	128 (67.0)
Problems	7 (3.7)	18 (9.4)	30 (15.7)	8 (4.2)	63 (33.0)
<b>Anxiety/depression</b>					
No problems	15 (7.9)	47 (24.6)	44 (23.0)	20 (10.5)	126 (66.0)
Problems	9 (4.7)	24 (12.6)	21 (11.0)	11 (5.8)	65 (34.0)

antihypertensive drugs was associated with EQ-VAS score, while current employment status was associated with EQ-5D utility.

The mean EQ-VAS score obtained in this study was similar to that reported among PLHIV on antiretroviral therapy in Ethiopia [21] and Thailand [22], but lower than the value obtained in a Columbian study [23]. The mean utility score was similar to the value reported among PLHIV in Columbia [23] but lower than values reported in Thailand [22] and Ethiopia [21]. Interestingly, the health state indices obtained in our study were higher than those reported in a Nigerian study among PLHIV [24]. Our findings could be due to several reasons: There is a tendency of patients to rate their health states higher than the general population due to factors such as coping [19]. A previous Nigerian study which assessed HRQoL with the brief version of the World Health Organization Quality of Life

instrument (WHOQOL-BREF) among patients with diabetes mellitus, cancer or HIV infection reported the highest HRQoL scores among PLHIV [25]. Further, despite being hypertensive, our participants were outpatients who had been on antiretroviral drugs for at least 3 months prior to the study, majority of which had undetectable viral load i.e. good virologic control. The recent scale-up and free availability of highly active antiretroviral therapy in Nigerian hospitals could explain the observed control of HIV infection in the present study.

We also observed a higher frequency of ‘problems’ in the anxiety/depression and pain/discomfort dimensions, in line with previous studies among PLHIV [21, 23, 24]. This suggests that providing (more) psychological support for PLHIV who are also hypertensive might maximize their HRQoL. Chronic pain with accompanying discomfort is common in PLHIV [26]. Hence, this population may require

**Table 4** Effect of patient variables on health status (N=191)

Variable	EQ-5D utility			EQ-VAS score		
	Mean rank	Test statistic	<i>P</i> value	Mean rank	Test statistic	<i>P</i> value
<b>Gender<sup>a</sup></b>						
Male	100.63	- 1.026	0.305	92.71	- 0.698	0.485
Female	92.73			98.32		
<b>Age (years)<sup>b</sup></b>						
< 40	103.40	4.127	0.248	113.04	2.666	0.446
40–49	103.47			93.42		
50–59	86.57			93.67		
≥ 60	92.94			93.60		
<b>Education<sup>b</sup></b>						
None	111.40	0.443	0.931	125.00	3.075	0.380
Primary	95.57			92.25		
Secondary	95.67			101.30		
Tertiary	95.49			90.00		
<b>Current employment status<sup>a</sup></b>						
Working	104.39	- 2.661	<b>0.008</b>	100.15	- 1.262	0.207
Not working	83.85			89.99		
<b>Blood pressure<sup>a</sup></b>						
Controlled (< 140/90 mmHg)	92.26	- 0.523	0.601	96.85	- 0.113	0.910
Not controlled (≥ 140/90 mmHg)	97.05			95.76		
<b>Viral load<sup>a</sup></b>						
Undetected (< 40 copies/mL)	95.84	- 0.074	0.941	96.83	- 0.373	0.709
Detected (≥ 40 copies/mL)	96.50			93.38		
<b>Duration on ART (years)<sup>b</sup></b>						
< 6	98.97	4.778	0.092	95.84	0.631	0.729
6–10	83.29			91.48		
> 10	102.38			98.86		
<b>Duration on AHDs (years)<sup>b</sup></b>						
≤ 1	97.57	0.367	0.832	106.17	6.558	<b>0.038</b>
2–5	93.40			84.51		
≥ 6	98.92			100.82		

ART antiretroviral therapy, AHDs antihypertensive drugs

<sup>a</sup>Mann–Whitney U test

<sup>b</sup>Kruskal Wallis test; bold figures are significant at  $p < 0.05$

pain medication prescriptions. Analgesics that interfere with their antihypertensive drugs should be avoided.

Although most of our participants had poor BP control, the largely ‘silent’ or asymptomatic nature of hypertension could be adduced to explain the relatively high self-rated health status. According to Van Duin et al. [27], having a single comorbidity had no effect on the HRQoL (as indicated by the EQ-VAS score) of PLHIV; however, having multiple (two or more) comorbidities had a substantial impact on their HRQoL (utility). Although the majority of the subjects had comorbidities, half of them had multiple comorbidities, and just approximately 3% were hypertensive, according to the authors. In contrast, the vast majority of our participants had just one comorbidity (hypertension), with only a few having

multiple comorbidities. This discrepancy could explain, at least in part, the comparatively high HRQoL obtained in this study as compared to that observed in van Duin et al’s study among HIV positive individuals with comorbidities.

In the present study, employment status was found to be significantly associated with HRQoL. Those who were currently working reported significantly higher HRQoL than those who were not working. A similar finding has been documented [28, 29]. Unemployment has a negative correlation with HRQoL due to the feeling of worthlessness, financial limitations and poor standard of living [29]. Being employed on the other hand, generally affords one the ability to take care of oneself; it may improve overall satisfaction with one’s life and hence, positively influence HRQoL.



In this study, the duration on antihypertensive medications was associated with HRQoL. Participants who had been on antihypertensive medications for up to one year reported the highest HRQoL. This could be attributable, at least in part, to the fact that this group of patients are younger than those who have had hypertension for longer periods of time and are less likely to have experienced any complications of the disease at the time.

The present study has some limitations. The use of a single tertiary hospital for this study may restrict the generalizability of our findings. Also, the cross-sectional design of this study precludes the ascertainment of causality. Although participants were selected by convenience, the sample comprised a clear majority ( $\approx 74\%$ ) of the study population in our study setting; hence, results could be a true reflection of the population's health indices. It is also worth noting that data was collected in 2018 – prior to the coronavirus disease 19 (COVID-19) pandemic; so, the results obtained at the time may not be identical to those obtained now. Finally, the use of the Zimbabwean value sets for valuation of participants' health states may not have reflected the true health status of our study population. This is because the health indices of both African countries (Nigeria and Zimbabwe) are not strictly identical.

Despite these limitations, this study highlights the need for health care providers, policymakers, stakeholders, and donor agencies to pay closer attention to common comorbidities in PLHIV, such as hypertension. It is worthy of note that the tendency of patients to overrate their health as observed in our study, might erroneously underestimate their need for healthcare [19]. Given the adverse health outcomes associated with uncontrolled BP particularly in PLHIV, health care providers and donor agencies should leverage the successes of HIV management to improve management of hypertension in this population. Health care providers can achieve this by reinforcing education on the need to adhere to treatment recommendations not just for HIV infection, but also for hypertension despite their perceived general well-being. On the part of the donor agencies, this could be achieved by increasing the availability and accessibility of antihypertensive medications to this population. The findings of this study also imply that in hypertensive PLHIV, proper pain management and psychological support (e.g., through support groups, psychotherapy, and counselling) may enhance their HRQoL.

## 5 Conclusions

The HRQoL of HIV positive persons with hypertension receiving care in a Nigerian hospital was high, irrespective of BP control status. Being currently employed and a short time on antihypertensive medications contributed to

improved HRQoL. There is a need to provide psychological support and employment for this population to maximise their HRQoL. Future studies to assess factors associated with poor BP control in this subset of PLHIV are recommended.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s40292-022-00527-4>.

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## Declarations

**Funding** No funds, grants, or other support was received for conducting this study.

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

**Ethics approval** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Health Research Ethical Committee of the University of Uyo Teaching Hospital (July 26, 2018/UUTH/AD/S/96/VOLXXI/188).

**Consent to participate** Informed consent to participate was obtained from all individual participants (or from the legally authorized representatives of participants with no education) included in the study.

**Author contributions** ILJ and CVU contributed to the study conception and design. Data collection, analysis and interpretation were performed by ILJ, CNI and DEE. The first draft of the manuscript was written by ILJ. CVU supervised the study. All authors read and approved the final manuscript.

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