Impact of the COVID-19 pandemic on the medical follow-up and psychosocial well-being of people living with HIV : a cross-sectional survey

Impact of the COVID-19 pandemic on the medical follow-up and psychosocial well-being of people living with HIV: A cross-sectional survey

Joseph Nelson Siewe Fodjo, MD; Global Health Institute, University of Antwerp, Belgium

Edlaine Faria de Moura Villela, MD, PhD; School of Medicine, Health Sciences Unit, Federal University of Jataí, Brazil

Stijn Van Hees, PharmD; Global Health Institute, University of Antwerp, Belgium

Thalia Tibério dos Santos; School of Medicine, Health Sciences Unit, Federal University of Jataí, Brazil

Pieter Vanholder; European AIDS Treatment Group, Brussels Belgium

Patrick Reyntiens; Sensoa, Antwerp, Belgium

Rafael Van den Bergh, PhD; Global Health Institute, University of Antwerp, Belgium

Robert Colebunders, MD, PhD; Global Health Institute, University of Antwerp, Belgium

Corresponding author: Robert Colebunders. Global Health Institute, University of Antwerp. Gouverneur Kinsbergen Center. Doornstraat 331. 2610, Wilrijk. Belgium.

Tel: +32 3 265 18 04. E-mail: robert.colebunders@uantwerpen.be

Conflicts of Interest and Source of Funding: RC received funding European Research Council (#671055). The authors declare no conflicts of interest.

Running title: HIV COVID-19 survey

Abstract

Background: Empirical data on the consequences of the novel coronavirus disease (COVID-19) pandemic on HIV care is lacking. We surveyed persons living with HIV (PLWH) in different countries to investigate whether their medical follow-up and psychosocial well-being had been compromised due to COVID-19 and associated restrictions.

Methods: In April 2020, a cross-sectional survey among PLWH was conducted using a web-based multilingual questionnaire. The research tool assessed HIV follow-up, psychosocial well-being, COVID-19 (flu-like) symptoms and prevention measures. Consenting respondents provided answers anonymously.

Results: 317 PLWH were included (mean age 43.4±11.7; 71.6% male); 60.3% of participants resided in Belgium and Brazil. 140 (44.2%) reported experiencing a cold with at least one flu-like symptom since January 2020. Of the 18 who reported COVID-19 test results, 4 (22.2%) were positive. Seventy-four (23.3%) respondents screened positive for major depressive disorders, while 72 (22.7%) had generalized anxiety disorders. Fifty-six (17.7%) respondents reported difficulties in obtaining antiretroviral medications because of COVID-19-related measures. Adaptations of HIV care during the COVID-19 outbreak included greater quantities of antiretroviral refill in 67 (21.1%), phone consultations in 25 (7.9%), and new refill sites in 12 (3.9%). Factors associated with reduced risk of experiencing flu-like symptoms included flu vaccination during the last 12 months (p=0.005) and adaptations of HIV care during the COVID-19 pandemic (p=0.010).

Conclusion: COVID-19 and associated restrictive measures seem detrimental to the well-being and follow-up of PLWH. We recommend that health systems devise innovative approaches for antiretroviral provision and psychosocial support to PLWH during such outbreaks.

Keywords: HIV; antiretroviral treatment; COVID-19; online survey

Introduction

The Severe Acute Respiratory Syndrome coronavirus-2 (SARS-Cov-2) outbreak which began in China in December 2019 has attained global proportions. Health systems around the world are severely affected by the coronavirus 2019 disease (COVID-19) pandemic, as the disease directly impacts the general population and specific vulnerable populations while also indirectly affecting non-COVID-19 healthcare. People living with HIV/AIDS (PLWH) represent a specific, vulnerable population that may potentially be confronted with manifold COVID-19-related risks.[1] Firstly, their reduced immune competence and higher prevalence of comorbidities could create a favorable terrain for severe disease. Secondly, COVID-19 disease may be more subtle to diagnose in PLWH since its symptoms resemble those of some pulmonary complications of HIV. Thirdly, large numbers of severely ill COVID-19 infected persons could overwhelm the healthcare system and compromise the quality and continuity of HIV treatment and care.[2]

PLWH accounted for 0.8-1.4% of hospitalized COVID-19 patients in studies from Wuhan (China), the United Kingdom, Barcelona (Spain), and New York (United States of America).[3–6] Initial data from small case series suggested that COVID-19 mortality in PLWH was rather low, and often attributable to co-morbidities rather than HIV itself.[7,8] However, recent preliminary findings from South Africa reveal that PLWH are at a higher risk of dying from COVID-19 compared to HIV-negative persons (Hazard Ratio: 2.75, 95% CI 2.09-3.61).[9] Of note, COVID-19 mortality among PLWH in the latter study did not depend on viral suppression nor the stage of HIV infection, but was almost exclusive to those who had co-morbidities (mainly diabetes and hypertension).[9]

It has been suggested that PLWH are not very likely to develop a severe form of COVID-19 infection because some antiretroviral treatment (ART) regimens may have some activity

against the coronavirus.[10] In this regard, ritonavir was investigated but did not prove effective against the SARS-Cov-2 in clinical studies.[11] Another antiretroviral drug suspected to have an anti-COVID-19 effect is tenofovir, given its structural similarity with remdesivir. Both drugs can tightly bind the RNA-dependent RNA polymerase (RdRp) of the SARS-Cov-2. Moreover, a recent trial with remdesivir showed that the drug significantly reduced recovery time and improved survival in hospitalized COVID-19 patients.[12] Therefore, tenofovir may also be active against the SARS-Cov-2 and could represent a promising tool in the fight against COVID-19.[13] Studies are underway to confirm its efficacy against the SARS-Cov-2.[14]

So far, little is known on the impact of COVID-19 on the medical follow-up and well-being of PLWH as the pandemic evolves. Besides causing a multi-organ disease, COVID-19 also poses a threat to the emotional and social well-being of PLWH and could interfere with routine HIV care by overburdening health facilities.[1] Anxiety and depressive disorders have previously been reported in PLWH,[15–17] and it is expected that the COVID-19 outbreak would exacerbate these symptoms due to widespread fear which is partly fueled by COVID-19 misinformation via the social media.[18] Also, little is currently known regarding the continuity of HIV care during the COVID-19 outbreak with the associated restrictions, particularly in resource-limited settings with under-performing healthcare systems. Confinement may lead to poor ART adherence as a result of disruptions in the supply chain and concerns about increased exposure to coronavirus in hospital settings, thereby discouraging PLWH from showing up for follow-up visits.[19] Recently, the South African national laboratory service reported a 10% drop in viral load testing in the public sector, suggesting indeed an interruption of HIV care.[9] In view of all these knowledge gaps, we conducted a survey to assess the possible consequences of the COVID-19 pandemic on the health and psychosocial well-being of PLWH, their access to healthcare services, and ART provision.

Methods

Study design

This was a cross-sectional study conducted among PLWH between April 9th and May 17th 2020. An online questionnaire was designed to assess the impact of the current COVID-19 pandemic on the life of PLWH. Respondents were invited to participate by filling the questionnaire through a web-link that was disseminated via the networks of various associations that support PLWH including the European AIDS Treatment Group (EATG), Sensoa (Flemish center of expertise for sexual health), and RNP+Brasil (National Network of PLWH in Brazil). The questionnaire consisted of four parts, inquiring on socio-demographic data, HIV-related information, COVID-related data, and questions on personal health as well as screening tests for psychosocial disorders (anxiety and depression). The screening tests used were the Population Health Questionnaire (PHQ-2) for depression[20] and the Generalized Anxiety Disorder (GAD-2) tool for anxiety.[21] The questionnaire was available in English, Dutch, French, Russian, and Portuguese; it was hosted on the secure website of the International Citizen Project COVID-19.[22] Only respondents who were at least 18 years old and who self-confirmed being PLWH were included. There were no exclusion criteria. An e-consent was required before submitting the responses. Participants were not promised nor given any form of compensation for their participation. A duplicate of the survey template can be found in the supplementary material of this paper (Appendix 6). The study protocol was approved by the Ethics Committee of the University of Antwerp (Belgium), Ref: 20/14/179.

Definitions

Generalized anxiety disorders were defined as having a GAD-2 score of at least 3. Similarly, all respondents who scored 3 or more on the PHQ-2 screening tool were considered as having major depressive disorders. Based on self-reported flu-like symptoms, the World Health Organization (WHO) clinical case definition for COVID-19 was applied on our data; any

respondent who had experienced fever associated with at least one respiratory symptom (cough, shortness of breath, sore throat, coryza) was considered as a suspected case of COVID-19.[23]

Statistical analyses

Continuous variables were reported as mean with standard deviation (mean ± SD) and compared across groups using non-parametric tests. Categorical variables were summarized into numbers with percentages; proportions were compared using the Yates-corrected Chi-Squared test. A multiple logistic regression analysis was performed to investigate factors associated with the development of flu-like illness since January 2020, when the COVID-19 started spreading to other countries and continents beyond the initial focus in China. Covariates for the final model were purposefully selected and included: sociodemographic variables (age, sex, country classification as lower and middle income countries [LMIC] vs high income countries [HIC] based on the World Bank data[24]), COVID-19 prevention (observance of physical distancing, mask use), and other health-related information (CD4 count, flu vaccination received during the past 12 months, treatment with tenofovir-containing ART regimens, and adaptation of HIV care during the lockdown). The rationale for choosing these covariates is summarized in the supplementary material (Appendix 5). All statistical tests were two-sided; $p<0.05$ was considered statistically significant, and 95% confidence intervals (CI) were computed. Statistical analyses were performed in R version 3.6.2.

Results

Participant characteristics

Data from 317 respondents were eligible for analysis. The mean age was 43.4 ± 11.7 years (range: 19-75); males were more represented in our study population (Table 1). Responses originated from 32 countries, half of which were classified as LMIC. Of note, the majority of

the participants resided either in Belgium (n=102, 32.2%) or Brazil (n=89, 28.1%); 59 (18.6%) responses originated from Eastern European countries (Supplementary appendix 1). Anxiety and depressive disorders were found in respectively 72 (22.7%) and 74 (23.3%) participants (Table 1); 50 PLWH (15.8%) had both anxiety and depressive disorders.

Table 1. Characteristics of study participants

Characteristics	**Observed**	**N**
Age, years: mean (SD)	43.4 (11.7)	317
Sex: n (%)		317
Male	227 (71.6%)	
Female	87 (27.4%)	
Other	3 (0.9%)	
Highest education level: n (%)		317
Primary	10 (3.2%)	
Secondary	88 (27.8%)	
Undergraduate	102 (32.2%)	
Post-graduate	117 (36.9%)	
Religion: n (%)		317
Christian	148 (46.7%)	
Muslim	10 (3.2%)	
Other	35 (11.0%)	
None	124 (39.1%)	
Marital status: n (%)		312
Single	136 (43.6%)	
Stable relationship	28 (9.0%)	
Cohabitation	53 (17.0%)	
Married	58 (18.6%)	
Divorced	25 (8.0%)	
Widowed	12 (3.8%)	
Most recent CD4 count, cells/μL: mean (SD)	682 (325)	241
CD4 count < 250 cells/μL: n (%)	19 (7.9%)	241
Viral load undetectable during last follow-up: n (%)	288 (94.4%)	305

Anxiety, GAD-2 score ≥ 3: n (%)	72 (22.7%)	317
Depression, PHQ-2 score ≥ 3: n (%)	74 (23.3%)	317
Vaccinated against flu in the last 12 months: n (%)	183 (57.7%)	317
COVID-19 test results: n (%) Positive Negative	 4 (22.2%) 14 (77.8%)	18

Regarding HIV treatment, the most frequently used anti-retroviral molecules among our participants were: Tenofovir in 193 (60.8%), Lamivudine in 144 (45.4%), and Dolutegravir in 131 (41.3%). Thirteen (4.2%) participants reported an interruption of ART during the COVID-19 lockdown period. Difficulties related to ART refill during the COVID-19 pandemic included: ART stock out at the clinic/pharmacy in 6 (1.9%); inability to go collect ART due to mobility restrictions in 21 (6.6%); and financial constraints in 2 (0.6%) participants. 104 (32.8%) participants reported some form of adaptation of HIV care during the COVID-19 lockdown period; adaptation strategies ranged from changing the amounts of ART refills to teleconsultation for HIV follow-up (Table 2).

Table 2. Reported adaptations for HIV care during the COVID-19 lockdown period (n=104)

Adaptation strategy	**Frequency**	**Percentage**
Increased ART refill quantity	67	64.4%
Reduced ART refill quantity	1	1.0%
Changed location for ART refill	12	11.5%
Phone consultation	25	24.0%
Self-monitoring	10	9.6%
Change in ART regimen	5	4.8%
Obtain ART without seeing a doctor	5	4.8%
Obtain ART without laboratory work-up	1	1.0%
ART prescription sent by email	3	2.9%
ART sent by post	3	2.9%

Follow-up by another doctor	1	1.0%

One hundred and thirty-eight (44.2%) respondents reported being less likely to interrupt ART during the lockdown period; meanwhile 11 (3.5%) were more likely to interrupt their treatment, and another 163 (52.2%) were as likely to stop ART as before the COVID-19 lockdown. More than half of the respondents (200 PLWH [63.1%]) reported recreational substance use, including consumption of alcohol, tobacco, and marijuana (Supplementary appendix 4).

COVID-19 reported symptoms and preventive behaviors in PLWH

Among the 140 (44.2%) PLWH who had experienced a cold since January 2020, the most frequent self-reported symptom was coryza (65.7%). Similar symptoms were reported by PLWH with a history of flu vaccination during the past 12 months and those who were not vaccinated (Table 3). Of note, all four PLWH who reported positive COVID-19 test results had at least one flu-like symptom. Applying the WHO clinical definition for COVID-19[23] on our entire study population (while assuming no prior contact with an infected individual), it was revealed that 54 (17.0%) of respondents were classified as suspected COVID-19 cases.

Table 3: Symptoms reported by 140 PLWH who experienced a cold between January and May 2020

Self-reported symptom	**Overall: (N=140)**	**Flu vaccine: No (n=71)**	**Flu vaccine: Yes (n=69)**	**P-value***
Fever	56 (40.0%)	30 (42.3%)	26 (37.7%)	0.704
Headaches	82 (58.6%)	41 (57.7%)	41 (59.4%)	0.977
Dry cough	52 (37.1%)	24 (33.8%)	28 (40.6%)	0.513
Productive cough	54 (38.6%)	30 (42.3%)	24 (34.8%)	0.463
Sore throat	84 (60.0%)	41 (57.7%)	43 (62.3%)	0.704
Coryza	92 (65.7%)	51 (71.8%)	41 (59.4%)	0.171
Loss of smell (anosmia)	17 (12.1%)	10 (14.1%)	7 (10.1%)	0.649
Loss of taste (ageusia)	18 (12.9%)	11 (15.5%)	7 (10.1%)	0.489

Shortness of breath	22 (15.7%)	11 (15.5%)	11 (15.9%)	1.000
Myalgia	53 (37.9%)	27 (38.0%)	26 (37.7%)	1.000
Fatigue	73 (52.1%)	42 (59.2%)	31 (44.9%)	0.130
Nausea	19 (13.6%)	11 (15.5%)	8 (11.6%)	0.670
Diarrhea	34 (24.3%)	15 (21.1%)	19 (27.5%)	0.492
Symptoms duration ≥ 2 weeks**	42/136 (30.9%)	25/69 (36.2%)	17/67 (25.4%)	0.236
**Yates corrected Chi-Squared test* ***4 missing values*				

Regarding coronavirus-related behaviors, most of the participants reported adhering to the protective measures to reduce their risk of contracting or spreading COVID-19: 285 (89.9%) observed the 1-2m physical distancing, 209 (65.9%) used face masks, 277 (87.4%) regularly washed their hands with water and soap during the day, 190 (89.9%) covered their mouth when coughing, and 200 (63.1%) avoided as much as possible to touch their face (eyes, nose, mouth). Observance of COVID-19 preventive measures was not different among PLWH who reported anxiety/depressive disorders and those who did not. A few disparities were noted between the characteristics and preventive behaviors of respondents who resided in LMIC compared to those in high income settings (Table 4).

Table 4: Comparison of PLWH residing in LMIC and HIC

	High income (n=145)	**Low-Middle income (n=172)**	**P-value***
Age, years: Mean (SD)	47.5 (12.5)	40 (9.8)	<0.0001
Most recent CD4 count: Mean (SD)	676 (295)[a]	686 (344)[b]	0.855
Anxiety disorders: n (%)	25 (17.2%)	47 (27.3%)	0.045
Depression disorders: n (%)	27 (18.6%)	47 (27.3%)	0.091
Adaptation of HIV care: n (%)	35 (24.1%)	69 (40.1%)	0.004
ART interruption: n (%)	5 (3.6%)	8 (4.7%)	0.831
Recreational substance use: n (%)	103 (71.0%)	97 (56.4%)	0.010
Observe physical distancing: n (%)	137 (94.5%)	148 (86.0%)	0.022

Face mask use: n (%)	58 (40.0%)	151 (87.8%)	<0.0001
Reported flu symptoms: n (%)	63 (43.4%)	77 (44.8%)	0.903
Reported flu vaccination: n (%)	88 (60.7%)	95 (55.6%)	0.420
[a]52 missing data; [b]24 missing data **Yates corrected Chi-Squared test or Mann Whitney U test as appropriate*			

We also compared our findings based on the continent of residence of the respondents: Europe (n=202), Latin America (n=90), and Asia (n=23); the two PLWH who resided in Africa were excluded from this analysis. We observed that PLWH in Asia were younger and had the lowest flu vaccination rates, while physical distancing was most frequently observed by PLWH in Europe (Supplementary appendix 2). In addition, no significant differences were noted in the prevalence of anxiety (p=0.833) and depression (p=0.650) across the continents. Further comparisons within the European continent revealed that PLWH from Eastern European countries (n=59) were less often vaccinated against flu and used face masks more frequently compared to those residing in Western Europe (n=143) (Supplementary appendix 3). Similar proportions of PLWH in Eastern and Western Europe had depressive disorders (p=0.171); however, anxiety tended to be more frequent among Eastern Europe residents, albeit non-significantly (30.5% vs 17.5% in Western Europe; p=0.062) (Supplementary appendix 3).

Factors associated with the development of flu-like illness during the COVID-19 outbreak

A multiple logistic regression model was constructed to investigate relevant factors that may be associated with the development of flu-like symptoms among PLWH. We did not include the participants' CD4 count in the final model because that information was not available for many participants (76 missing values) and moreover, no association was observed between CD4 count and the development of flu-like symptoms when conducting bivariate analysis (Odd's ratio=1.000; 95% CI: 0.999–1.001; p=0.951). We observed that previous vaccination against flu and reported adaptations to ensure continuity of HIV care during the COVID-19

outbreak significantly reduced the odds of PLWH developing flu-like symptoms during the COVID-19 outbreak. The use of tenofovir-containing ART regimen had no impact on the odds of developing flu-like symptoms among our participants.

Table 5: Predictive factors for the development of flu-like illness among PLWH

Covariates	**Crude OR (95% CI)**	**Adjusted OR (95% CI)**	**P-value**
Age	0.997 (0.979 – 1.016)	1.000 (0.980 – 1.022)	0.935
Female sex	0.865 (0.522 – 1.423)	0.799 (0.466 – 1.360)	0.412
Residence in LMIC	1.055 (0.676 – 1.648)	1.054 (0.590 – 1.884)	0.859
Physical distancing observance	1.175 (0.563 – 2.521)	1.200 (0.554 – 2.667)	0.647
Face mask use	1.167 (0.731 – 1.872)	1.274 (0.730 – 2.237)	0.396
Flu vaccination last 12 months	0.528 (0.335 – 0.830)	0.512 (0.320 – 0.818)	0.005
Tenofovir ART regimen	1.042 (0.662 – 1.644)	1.188 (0.732 – 1.939)	0.487
Adaptation HIV care during lockdown period	0.555 (0.339 – 0.897)	0.513 (0.307 – 0.848)	0.010
OR: Odd's Ratio; CI: Confidence Interval; Model AIC=430.7			

Discussion

Our study provides more insight into the impact of the COVID-19 pandemic on the lives of PLWH around the world. The outbreak has undeniably had its toll on HIV care and has stimulated different adaptations of the healthcare systems to ensure that PLWH still receive proper follow-up and treatment. Only 18 (5.7%) PLWH had been tested for COVID-19, although the application of WHO diagnostic criteria revealed that the actual number of suspected COVID-19 cases requiring testing in our study population was three times higher. This indeed demonstrates that actions against COVID-19 still fall short in many countries, even when it concerns special populations like PLWH.

The GAD-2 and PHQ-2 screening tools revealed that almost one quarter of PLWH had at least one psychosocial disorder. Considering the entire study population, generalized anxiety disorders were less frequently observed in our survey when compared to previous findings

among PLWH before the onset of COVID-19;[15,16] however, the differences in methodologies make it difficult to compare studies. The prevalence of major depressive disorders was much higher in our survey than that observed among PLWH in Kenya using similar methods, in a COVID-free setting.[17] A meta-analysis has highlighted that the burden of depression among PLWH was highest in South America;[25] our data showed a similar tendency, as the highest prevalence of depression was observed in the Latin American continent (26.7%), although this was not significantly different from the prevalence of depression in Europe and Asia. Furthermore, depression tended to be more frequent among PLWH residing in LMIC compared to HIC but the difference was not significant. Meanwhile, anxiety was clearly more prevalent among LMIC participants (Table 4); the unequal burden of psychosocial problems in these two settings could be related to a higher perceived social judgment and stigma vis-à-vis PLWH in developing countries.[26] Although poverty and psychosocial stress have been associated with increased risk for substance use,[27,28] our survey found that LMIC residents resorted to recreational substances less frequently than their counterparts in HIC. The reasons underpinning this observation are probably multifactorial, spanning from financial constraints for substance purchase, to the varied socio-cultural acceptance of substance use in LMIC.

Besides the disparities in psychosocial well-being, we noted that PLWH in LMIC were younger, and were less likely to observe physical distancing than PLWH residing in HIC. These findings reflect the demographic structure and crowded living conditions often encountered in low-income settings.[29] Although a younger population presents a lower risk for COVID-19 morbidity and mortality,[30] preventive measures are still crucial in these communities to limit coronavirus transmission to more vulnerable persons such as those who are older or with co-morbid conditions. Fortunately, the higher rates of mask use reported among PLWH in LMIC may help curb the spread of the disease in these settings where physical distancing is difficult.

Our multivariable model (Table 5) showed that PLWH who had been vaccinated against flu within the 12 months preceding the survey were less likely to experience flu-like symptoms even amidst of the COVID-19 pandemic. Yearly flu vaccination in PLWH is currently internationally recommended.[31] Flu vaccination will reduce the number PLWH who develop flu-like symptoms as well as the anxiety generated by these symptoms in the context of a COVID-19 epidemic. It also will reduce the workload of the healthcare workers because it will decrease the number of suspected cases requiring clinical attention and confirmatory testing. Our findings equally suggest that once the flu-like illness has developed in PLWH, previous flu vaccination has no effects on the prevalence and duration of symptoms (Table 3). Whether the flu shot confers specific protection against COVID-19 is yet to be established.[32]

Our study describes the experiences of PLWH during the ongoing COVID-19 pandemic in a multi-country setting. Nonetheless, our results must be interpreted in light of a number of limitations. This was a cross-sectional survey of the situation during the ongoing pandemic, and it is therefore not possible to know to what extent COVID-19 was responsible for the reported findings. In addition, the web-based nature of our survey introduces an important sampling bias because only individuals of a certain socio-economic class with access to internet and willing to contribute to science will participate. Moreover, it is impossible to verify the veracity of the information provided by the respondents. We also acknowledge that our convenience-based sample size may be small. However, considering the exceptional circumstances imposed by the ongoing COVID-19 outbreak, we are confident our findings still provide useful insights into the realities faced by PLWH during this pandemic.

In conclusion, COVID-19 and associated restrictive measures have adversely impacted the well-being and follow-up of PLWH. It appears that LMIC residents are more affected than those residing in high income settings. Furthermore, routine flu vaccinations and adaptations of healthcare systems to ensure continuity of HIV care during the pandemic may minimize the

development of flu-like illness among PLWH, thereby reducing personal stress and preventing additional strain on the healthcare providers. While more research is needed to confirm these findings, it is important that health systems devise innovative approaches for antiretroviral provision and psychosocial support to PLWH during such outbreaks.[19]

References

1. Shiau S, Krause KD, Valera P, Swaminathan S, Halkitis PN. The Burden of COVID-19 in People Living with HIV: A Syndemic Perspective. *AIDS Behav*. Published online April 18, 2020:s10461-020-02871-02879. doi:10.1007/s10461-020-02871-9

2. Jiang H, Zhou Y, Tang W. Maintaining HIV care during the COVID-19 pandemic. *The Lancet HIV*. 2020;7(5):e308-e309. doi:10.1016/S2352-3018(20)30105-3

3. Blanco JL, Ambrosioni J, Garcia F, et al. COVID-19 in patients with HIV: clinical case series. *The Lancet HIV*. 2020;7(5):e314-e316. doi:10.1016/S2352-3018(20)30111-9

4. Richardson S, Hirsch JS, Narasimhan M, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*. Published online April 22, 2020. doi:10.1001/jama.2020.6775

5. Docherty AB, Harrison EM, Green CA, et al. *Features of 16,749 Hospitalised UK Patients with COVID-19 Using the ISARIC WHO Clinical Characterisation Protocol*. Infectious Diseases (except HIV/AIDS); 2020. doi:10.1101/2020.04.23.20076042

6. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061. doi:10.1001/jama.2020.1585

7. Härter G, Spinner CD, Roider J, et al. COVID-19 in people living with human immunodeficiency virus: a case series of 33 patients. *Infection*. Published online May 11, 2020. doi:10.1007/s15010-020-01438-z

8. Gervasoni C, Meraviglia P, Riva A, et al. Clinical features and outcomes of HIV patients with coronavirus disease 2019. *Clinical Infectious Diseases*. Published online May 14, 2020:ciaa579. doi:10.1093/cid/ciaa579

9. People with HIV at greater risk of COVID-19 death in South African study. aidsmap.com. Accessed July 5, 2020. https://www.aidsmap.com/news/jun-2020/people-hiv-greater-risk-covid-19-death-south-african-study

10. Laurence J. Why Aren't People Living with HIV at Higher Risk for Developing Severe Coronavirus Disease 2019 (COVID-19)? *AIDS Patient Care and STDs*. Published online May 14, 2020:apc.2020.29005.com. doi:10.1089/apc.2020.29005.com

11. Cao B, Wang Y, Wen D, et al. A Trial of Lopinavir–Ritonavir in Adults Hospitalized with Severe Covid-19. *N Engl J Med*. 2020;382(19):1787-1799. doi:10.1056/NEJMoa2001282

12. Beigel JH, Tomashek KM, Dodd LE, et al. Remdesivir for the Treatment of Covid-19 — Preliminary Report. *N Engl J Med*. Published online May 22, 2020:NEJMoa2007764. doi:10.1056/NEJMoa2007764

13. Elfiky AA. Ribavirin, Remdesivir, Sofosbuvir, Galidesivir, and Tenofovir against SARS-CoV-2 RNA dependent RNA polymerase (RdRp): A molecular docking study. *Life Sciences*. 2020;253:117592. doi:10.1016/j.lfs.2020.117592

14. Randomized Clinical Trial for the Prevention of SARS-CoV-2 Infection (COVID-19) in Healthcare Personnel - Full Text View - ClinicalTrials.gov. Accessed May 28, 2020. https://clinicaltrials.gov/ct2/show/NCT04334928

15. Brandt C, Zvolensky MJ, Woods SP, Gonzalez A, Safren SA, O'Cleirigh CM. Anxiety symptoms and disorders among adults living with HIV and AIDS: A critical review and integrative synthesis of the empirical literature. *Clinical Psychology Review*. 2017;51:164-184. doi:10.1016/j.cpr.2016.11.005

16. Shacham E, Morgan JC, Önen NF, Taniguchi T, Overton ET. Screening Anxiety in the HIV Clinic. *AIDS Behav*. 2012;16(8):2407-2413. doi:10.1007/s10461-012-0238-6

17. Monahan PO, Shacham E, Reece M, et al. Validity/Reliability of PHQ-9 and PHQ-2 Depression Scales Among Adults Living with HIV/AIDS in Western Kenya. *J GEN INTERN MED*. 2009;24(2):189-197. doi:10.1007/s11606-008-0846-z

18. Tasnim S, Hossain MM, Mazumder H. Impact of Rumors and Misinformation on COVID-19 in Social Media. *J Prev Med Public Health*. 2020;53(3):171-174. doi:10.3961/jpmph.20.094

19. Aristide C, Okello S, Bwana M, Siedner MJ, Peck RN. Learning from People with HIV: Their Insights are Critical to Our Response to the Intersecting COVID-19 and HIV Pandemics in Africa. *AIDS Behav*. Published online June 30, 2020. doi:10.1007/s10461-020-02955-6

20. Kroenke K, Spitzer RL, Williams JBW. The Patient Health Questionnaire-2: Validity of a Two-Item Depression Screener. *Medical Care*. 2003;41(11):1284-1292. doi:10.1097/01.MLR.0000093487.78664.3C

21. Kroenke K, Spitzer RL, Williams JBW, Monahan PO, Löwe B. Anxiety Disorders in Primary Care: Prevalence, Impairment, Comorbidity, and Detection. *Annals of Internal Medicine*. 2007;146(5):317-325. doi:10.7326/003-4819-146-5-200703060-00004

22. ICPCovid research group. International Citizen Project Covid-19. Published March 2020. Accessed May 11, 2020. https://www.icpcovid.com/

23. World Health Organization. Global surveillance for COVID-19 caused by human infection with COVID-19 virus: interim guidance. Published March 2020. Accessed May 11, 2020. https://apps.who.int/iris/rest/bitstreams/1272502/retrieve

24. World Bank Country and Lending Groups – World Bank Data Help Desk. Accessed May 24, 2020. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

25. Rezaei S, Ahmadi S, Rahmati J, et al. Global prevalence of depression in HIV/AIDS: a systematic review and meta-analysis. *BMJ Support Palliat Care*. Published online September 19, 2019:bmjspcare-2019-001952. doi:10.1136/bmjspcare-2019-001952

26. Tran BX, Phan HT, Latkin CA, et al. Understanding Global HIV Stigma and Discrimination: Are Contextual Factors Sufficiently Studied? (GAPRESEARCH). *IJERPH*. 2019;16(11):1899. doi:10.3390/ijerph16111899

27. Torres-Berrio A, Cuesta S, Lopez-Guzman S, Nava-Mesa MO. Interaction Between Stress and Addiction: Contributions From Latin-American Neuroscience. *Front Psychol*. 2018;9:2639. doi:10.3389/fpsyg.2018.02639

28. Smyth NJ, Kost KA. Exploring the Nature of the Relationship Between Poverty and Substance Abuse: Knowns and Unknowns. *Journal of Human Behavior in the Social Environment*. 1998;1(1):67-82. doi:10.1300/J137v01n01_05

29. Batana YM, Cockburn JM. *Do Demographics Matter for African Child Poverty ?* The World Bank; 2018:1-23. Accessed May 26, 2020. http://documents.worldbank.org/curated/en/589781525350527565/pdf/WPS8426.pdf

30. Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. *The Lancet Infectious Diseases*. Published online March 2020:S1473309920302437. doi:10.1016/S1473-3099(20)30243-7

31. Crum-Cianflone NF, Sullivan E. Vaccinations for the HIV-Infected Adult: A Review of the Current Recommendations, Part I. *Infect Dis Ther*. 2017;6(3):303-331. doi:10.1007/s40121-017-0166-x

32. Salem ML, El-Hennawy D. The possible beneficial adjuvant effect of influenza vaccine to minimize the severity of COVID-19. *Medical Hypotheses*. 2020;140:109752. doi:10.1016/j.mehy.2020.109752

List of Supplemental Digital Content:

Supplementary material.pdf

Table 1. Characteristics of study participants

Characteristics	**Observed**	**N**
Age, years: mean (SD)	43.4 (11.7)	317
Sex: n (%)		317
Male	227 (71.6%)	
Female	87 (27.4%)	
Other	3 (0.9%)	
Highest education level: n (%)		317
Primary	10 (3.2%)	
Secondary	88 (27.8%)	
Undergraduate	102 (32.2%)	
Post-graduate	117 (36.9%)	
Religion: n (%)		317
Christian	148 (46.7%)	
Muslim	10 (3.2%)	
Other	35 (11.0%)	
None	124 (39.1%)	
Marital status: n (%)		312
Single	136 (43.6%)	
Stable relationship	28 (9.0%)	
Cohabitation	53 (17.0%)	
Married	58 (18.6%)	
Divorced	25 (8.0%)	
Widowed	12 (3.8%)	
Most recent CD4 count, cells/μL: mean (SD)	682 (325)	241
CD4 count < 250 cells/μL: n (%)	19 (7.9%)	241
Viral load undetectable during last follow-up: n (%)	288 (94.4%)	305
Anxiety, GAD-2 score ≥ 3: n (%)	72 (22.7%)	317
Depression, PHQ-2 score ≥ 3: n (%)	74 (23.3%)	317
Vaccinated against flu in the last 12 months: n (%)	183 (57.7%)	317
COVID-19 test results: n (%)		18
Positive	4 (22.2%)	
Negative	14 (77.8%)	

Table 2. Reported adaptations for HIV care during the COVID-19 lockdown period (n=104)

Adaptation strategy	**Frequency**	**Percentage**
Increased ART refill quantity	67	64.4%
Reduced ART refill quantity	1	1.0%
Changed location for ART refill	12	11.5%
Phone consultation	25	24.0%
Self-monitoring	10	9.6%
Change in ART regimen	5	4.8%
Obtain ART without seeing a doctor	5	4.8%
Obtain ART without laboratory work-up	1	1.0%
ART prescription sent by email	3	2.9%
ART sent by post	3	2.9%
Follow-up by another doctor	1	1.0%

Table 3: Symptoms reported by 140 PLWH who experienced a cold between January and May 2020

Self-reported symptom	Overall: (N=140)	Flu vaccine: No (n=71)	Flu vaccine: Yes (n=69)	P-value*
Fever	56 (40.0%)	30 (42.3%)	26 (37.7%)	0.704
Headaches	82 (58.6%)	41 (57.7%)	41 (59.4%)	0.977
Dry cough	52 (37.1%)	24 (33.8%)	28 (40.6%)	0.513
Productive cough	54 (38.6%)	30 (42.3%)	24 (34.8%)	0.463
Sore throat	84 (60.0%)	41 (57.7%)	43 (62.3%)	0.704
Coryza	92 (65.7%)	51 (71.8%)	41 (59.4%)	0.171
Loss of smell (anosmia)	17 (12.1%)	10 (14.1%)	7 (10.1%)	0.649
Loss of taste (ageusia)	18 (12.9%)	11 (15.5%)	7 (10.1%)	0.489
Shortness of breath	22 (15.7%)	11 (15.5%)	11 (15.9%)	1.000
Myalgia	53 (37.9%)	27 (38.0%)	26 (37.7%)	1.000
Fatigue	73 (52.1%)	42 (59.2%)	31 (44.9%)	0.130
Nausea	19 (13.6%)	11 (15.5%)	8 (11.6%)	0.670
Diarrhea	34 (24.3%)	15 (21.1%)	19 (27.5%)	0.492
Symptoms duration ≥ 2 weeks**	42/136 (30.9%)	25/69 (36.2%)	17/67 (25.4%)	0.236

**Yates corrected Chi-Squared test*
***4 missing values*

Table 4: Comparison of PLWH residing in LMIC and HIC

	High income (n=145)	**Low-Middle income (n=172)**	**P-value***
Age, years: Mean (SD)	47.5 (12.5)	40 (9.8)	<0.0001
Most recent CD4 count: Mean (SD)	676 (295)[a]	686 (344)[b]	0.855
Anxiety disorders: n (%)	25 (17.2%)	47 (27.3%)	0.045
Depression disorders: n (%)	27 (18.6%)	47 (27.3%)	0.091
Adaptation of HIV care: n (%)	35 (24.1%)	69 (40.1%)	0.004
ART interruption: n (%)	5 (3.6%)	8 (4.7%)	0.831
Recreational substance use: n (%)	103 (71.0%)	97 (56.4%)	0.010
Observe physical distancing: n (%)	137 (94.5%)	148 (86.0%)	0.022
Face mask use: n (%)	58 (40.0%)	151 (87.8%)	<0.0001
Reported flu symptoms: n (%)	63 (43.4%)	77 (44.8%)	0.903
Reported flu vaccination: n (%)	88 (60.7%)	95 (55.6%)	0.420

[a]52 missing data; [b]24 missing data

**Yates corrected Chi-Squared test or Mann Whitney U test as appropriate*

Table 5: Predictive factors for the development of flu-like illness among PLWH

Covariates	**Crude OR (95% CI)**	**Adjusted OR (95% CI)**	**P-value**
Age	0.997 (0.979 – 1.016)	1.000 (0.980 – 1.022)	0.935
Female sex	0.865 (0.522 – 1.423)	0.799 (0.466 – 1.360)	0.412
Residence in LMIC	1.055 (0.676 – 1.648)	1.054 (0.590 – 1.884)	0.859
Physical distancing observance	1.175 (0.563 – 2.521)	1.200 (0.554 – 2.667)	0.647
Face mask use	1.167 (0.731 – 1.872)	1.274 (0.730 – 2.237)	0.396
Flu vaccination last 12 months	0.528 (0.335 – 0.830)	0.512 (0.320 – 0.818)	0.005
Tenofovir ART regimen	1.042 (0.662 – 1.644)	1.188 (0.732 – 1.939)	0.487
Adaptation HIV care during lockdown period	0.555 (0.339 – 0.897)	0.513 (0.307 – 0.848)	0.010
OR: Odd's Ratio; CI: Confidence Interval; Model AIC=430.7			