Incidence and severity of COVID-19 among HIV positive patients with existing co-morbidities

Abstract

Background: The extent to which people living with human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) (PLWHA) are susceptible to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections and their risk of mortality is not well documented. PLWHA have a distinct profile because of their immune system alterations from chronic HIV infection and their use of antiretroviral therapy, some of which have been investigated for treating coronavirus disease 2019 (COVID-19). The situation becomes even worse when the HIV patient has existing comorbidities.

Methods: Confirmed disease was defined as any patient with a positive antigen test, reverse transcriptase polymerase chain reaction, or serology for SARS-CoV-2. We compared the characteristics of patients with mild disease (asymptomatic included) with those with moderate or severe disease (requiring admission).

Results: Older participants were more likely to have comorbidities, with diabetes and hypertension being the most common. It also found that the severity of these comorbidities worsened during the COVID-19 pandemic, leading to an increase in vaccine uptake among those with pre-existing conditions. Additionally, some participants developed new comorbidities as a result of COVID-19, possibly due to weakened immune systems.

Conclusion: Individuals with HIV face an increased risk of severe SARS-CoV-2 infection because of their weakened immune systems. Those with HIV/AIDS who also have comorbidities like diabetes and hypertension are at an even greater risk.

Keywords: COVID-19, SARS-Cov-2, HIV, AIDS, incidence, severity, comorbidities

Raphael Mwamtsi Lwembe, Joseph Newton Guni, Mary Muyeku, Lihana Wekesa, Joseph Muriuki, Joseph Mwangi, Alex Maiyo, Judy Chege, Joyceline Kinyua, Dama Olungae, Rency Iel, Nancy Lagat, Collins Okoyo, Edward K Maina, Khamadi Ashimosi

[1]Kenya Medical Research Institute (KEMRI), Kenya

Correspondence: Raphael Mwamtsi Lwembe, Kenya Medical Research Institute (KEMRI), Nairobi, Kenya, Tel +254 (0) 718 876976, Email jrmwamtsi@gmail.com and Joseph Newton Guni, Kenya Medical Research Institute (KEMRI), Nairobi, Kenya, Email newtonguni@gmail.com

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Abbreviations:

COVID, corona virus disease; SARS-Cov-2, severe acute respiratory syndrome coronavirus 2; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; PL WHA, people living with HIV/AIDS; CD4, clusters of differentiation 4; ICU, intensive care unit; KII, key informant interview; CCC, comprehensive care clinic

Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, emerged in Wuhan, China, and swiftly spread worldwide, affecting over 180 countries.[1,2] As research on this novel coronavirus progresses, many uncertainties remain regarding its impact on different populations. Elderly individuals and those with underlying medical conditions such as HIV, hypertension, diabetes, cancer, cardiovascular disease, chronic kidney disease, and obesity tend to experience more severe outcomes.[3] Specifically, individuals living with HIV and other comorbidities face a heightened risk, leading to increased morbidity and mortality rates, as well as more frequent hospitalizations and ICU admissions.[4,5]

There is a concern that the immune-suppressive effects of HIV could make PLWHA more vulnerable to SARS-CoV-2 infection and more likely to develop severe COVID-19 symptoms.[6] Evidence suggests that PLWHA with low CD4 counts and those not receiving antiretroviral therapy (ART) are at the greatest risk of severe COVID-19.[7,8] However, some studies propose that immunosuppression and low CD4 cell counts might offer protection against the cytokine storm seen in COVID-19 patients.[9] With nearly 40 million PLWHA globally, it is crucial to understand the epidemiology and outcomes of COVID-19 in this population, including ICU admissions, mechanical ventilation, and mortality rates.[5]

Due to the dynamic nature of the COVID-19 pandemic and the large number of PLWHA worldwide, close monitoring of infection rates among this population is essential.[10,11] With 37.9 million PLWHA globally and 1.7 million new infections annually, cases of COVID-19-HIV coinfection are expected to rise.[10,12] In Kenya, as of 2020, approximately 1,700,000 individuals were living with HIV, with 33,000 new infections reported annually, highlighting an increasing number of COVID-19 vulnerable populations due to HIV.[4] As of May 13, 2022, Kenya reported a total of 323,975 confirmed COVID-19 cases, 246,621 recoveries, and 5,649 deaths, with a global total of 520,663,148 cases and 6,262,449 deaths.[4]

The increasing numbers of PLWHA at risk of SARS-CoV-2 infection emphasize the need for heightened vigilance.[6,13] The WHO has identified HIV as an independent risk factor for SARS-CoV-2 infection, although it remains unclear whether PLWHA are at increased risk of severe COVID-19.[14] Vigilance in monitoring COVID-19 among PLWHA is crucial, particularly in light of evolving SARS-CoV-2 variants and the rollout of COVID-19 vaccines.[14]

This study aims to investigate the incidence and severity of COVID-19 among HIV- positive patients with existing comorbidities, providing essential evidence to guide the prevention, treatment, and management of PLWHA with and without underlying diseases.

Methodology

Study design

The study employed both retrospective and prospective arms. Retrospectively, individual patient data was extracted from files while prospective data was obtained from participants before analysis.

A repeat cross-sectional study was conducted where a cohort of PLWHA was followed up thrice a month for a period of 18 months. Mixed methods comparison, analytical and descriptive design both quantitative and qualitative was applied.

Qualitative data was collected concurrently using key informant interviews (KII) to assess ART adherence, comorbidities, and COVID-19 vaccines access and uptake.

Study context

HIV comprehensive care clinics in Kilifi, Kisumu and Nakuru County hospitals were visited between 11th March 2019 and December 2023. Hospitals were selected based on PLWHA volume; Counties reported spikes; provide HIV-comprehensive care; maintain individual level patient files and have Known ART adherence rates. SARS- CoV—2 infections were compared among those who received HIV treatment, treatment for HIV related comorbidities, immune factors and vaccine uptake.

Study population and sampling methods

Records from 308 HIV-positive persons receiving ART from Nakuru, Mariakani, Malindi and Kisumu hospitals.

421 HIV-positive persons receiving ART; With laboratory test results representing either of two groups i.e. Virally suppressed and clinically healthy and those with advanced disease with CD4 cell counts <200 cells/mm3 and viral failure; attending CCC at the selected sites; recently referred for initial testing and not yet in the system, able and willing to consent (for those above 18 years), and assent for those 15-17 years of age [Minors], whose parents/guardian provide consent/permission to participate, willing to be followed up for 18 months including emancipated minors 15-17 years, able and willing to provide consent.

Sampling

Medical records of individual patients that were comprehensive were included. Extraction of ART Variables (regimen, adherence, duration of use); Socio- demographics (age, gender, occupation); Outcomes associated with COVID-19; Laboratory results (CD4 cell counts, viral loads, fasting blood sugar levels, radiology results) and Clinical parameters/anthropometry/obesity (weight, height, BMI, waist circumference/girth, MUAC) was done from individual patient records. Data was Compared between Case (file showing patient who had defaulted for HIV treatment using ARV since the onset of COVID-19) and Control (file from patient who had never defaulted for HIV treatment during the period of interest).

HIV infected patients with comprehensive medical records selected were included in the prospective study.

Data collection

Retrospective data was extracted from existing patient files using a data abstraction tool designed for the study. Prospective data was obtained from participants who were recruited for the study. Data collected included Data on : Medications (ART regimen, ART adherence, duration of ART use); Socio-demographics: age, gender, occupation; Comorbidities (asthma, diabetes, cardiovascular disease, chronic lung disease, chronic kidney disease, chronic liver disease, malignancy); Outcomes associated with COVID-19; Laboratory results (CD4 cell counts, Viral loads, fasting blood sugar levels), radiology results) and Clinical parameters/anthropometry/obesity (weight, height, BMI, waist circumference/girth, MUAC).

Data management

Data from the audio recorders and transcripts were labeled daily by the research assistants who later transferred them to a KEMRI data drive via a secure password- protected link and to a password-protected laptop and after transcription. Thereafter the audio recordings were subsequently deleted.

Data analysis

Before the data was analyzed, a thorough Verification of all the interview audio recordings and the transcribed data was done by the PI and the Research Assistant. This entailed listening to the audio recordings and making sure all the data was captured during transcription. The researchers also submitted the reflective notes generated during the interviews. The interview transcripts were used in the development of a solid coding framework that contains all the emerging themes and sub-themes. This informed the coding framework to be adopted.

All data was then uploaded in NVIVO 12, qualitative data analysis software. The data was coded into respective nodes or themes in a three-level coding process after which a comprehensive code book was generated.

Findings

Our findings showed that there was a tremendous incidence (prevalence) of comorbidities among the participants, especially those with an advanced age. The most common comorbidities included TB, hypertension, arthritis and diabetes.

Incidence

"Yes, we have patients with diabetes, hypertension, other they have arthritis they can't walk they are being supported."

KII

"So, for the HIV we had several patients with diabetes, we have others with hypertension and even arthritis, TB infection, because it's a short term, its being treated. We had several cases with TB, meningitis and others, yes, we have such patients."

KII

"In fact, for comorbidities, most of them, especially diabetes, diabetes and hypertensive. Those are some of the clients with comorbidity who are really highly affected with the COVID, and this one, we can get the information from those who passed through the CCC because as the department of lab, we used to do a lot of blood sugars for those guys. So what I can say, there was a difference between those who were having comorbidity and those who didn't."

KII

Severity

HIV positive patients were at a greater risk of contracting the virus. This severity became even advanced with the existence of the comorbidities due to incredibly debilitated immune system.

"Yeah. We had some who had. Yeah. We had some hypertensive clients, diabetic clients. But for the clients who had comorbidities, the uptake of the vaccines was very high because they had an understanding that if you had a comorbidity, you were at a very high risk. So they took the vaccine positively."

KII

"In fact, for comorbidities, most of them, especiallys, diabetes and hypertensive. Those are some of the clients with comorbidity who are really highly affected with the COVID, and this one, we can get the information from those who passed through the CCC because as the department of lab, we used to do a lot of blood sugars for those guys. So what I can say, there was a difference between those who were having comorbidity and those who didn't."

KII

Development of comorbidities after COVID due to the compromised immunity and poor retention

Some of the HIV positive patients who contracted the corona virus developed comorbidities.

"I think COVID-19 came with also other psychological effects. And one of it is that the patient who we were managing also had some anxiety, got into anxiety disorders, and also started having also panic attacks. And even after COVID, some of the patients that we had some follow-up on had such coexisting, the panic attack and the anxiety disorder. Another thing was COVID-19 was also causing lung fibrosis among some of our patients. And so some of them, even post-COVID, will have to undergo long-term follow-up because of the effect that occurred to them. They're having some difficulty breathing, some of them had to be discharged on oxygen and have still been using oxygen, and some of them succumbed afterwards because of the severity of the lung involvement, especially for the ones who got extensive lung fibrosis. There are those who got some prolonged effect like the loss of smell for over six months, over one year. I can say I was also a victim of loss of smell."

KII

"However, the number that also had been diagnosed was on follow-up and defaulted. Majority of them, by the time they were coming it was like they were having some of the existing comorbidities already and especially opportunistic infections. And then in addition to the virus itself and the severity, those one we didn't have a good outcome out of them. They are majority who we ended up losing."

KII

Discussion

The study focused on examining demographic characteristics, comorbidities, clinical features, and diagnostic data pertaining to COVID-19 in a limited number of participants. It aimed to compare the frequency and seriousness of various comorbidities such as diabetes, hypertension, arthritis, tuberculosis, and meningitis, among others, in relation to the patients' COVID-19 positivity status. The findings revealed that these comorbidities were predominantly present in older participants, with diabetes and hypertension being the most prevalent.

Moreover, the study discovered a worsening of comorbidity severity with the onset of the COVID-19 pandemic. Consequently, there was a notable increase in vaccine uptake among patients with pre-existing comorbidities. Additionally, the research highlighted that some participants developed new comorbidities as a result of COVID-19, likely due to compromised immune function.

Conclusion

Since the onset of the COVID-19 outbreak in late 2019, there has been a global increase in cases and daily deaths, affecting health, social, and economic sectors worldwide.[1,4,15] Despite the rapid and widespread nature of the virus, the medical and scientific communities have swiftly collaborated to understand and manage the pandemic. While more research is needed, there is some understanding of vulnerable groups, particularly those with comorbidities and older age groups, who are at increased risk of contracting COVID-19.[16–24]

This study examined the occurrence and severity of COVID-19 among individuals with existing comorbidities. The results showed a higher incidence and severity of comorbid conditions in COVID-19 patients, leading to a higher fatality rate in this group.

These findings are consistent with other studies, which also identify individuals with comorbidities as vulnerable to severe COVID-19 complications. Therefore, it is advisable for those with underlying comorbidities to take extra precautions, especially in areas with high infection rates. As effective antiviral therapies and vaccines are developed, targeted interventions should be considered to protect this vulnerable group. This review can assist policymakers, clinicians, and researchers in making informed decisions as they develop new strategies to combat the pandemic.

Acknowledgments

Conflict of interests

The author declares that there are no conflicts of interest.

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