COVID-19 in HIV: a Review of Published Case Reports

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Abstract
Patients with COVID-19 present with a myriad of comorbidities. An immunocompromised state like HIV in patients with COVID-19 can be life-threatening. We searched PubMed/Medline, Scopus, and Web of Science for case reports and case series about COVID-19 in HIV patients. We finally reviewed 20 case reports including cases of 43 patients with HIV and COVID-19. The mean age of 43 adult patients was 51.56 ± 27.56 years (range 24–76 years). Of these, 30 were male (69.77%), 11 were female (25.58%), and 2 were transgender (4.65%). A total of 25 patients (58.14%) were above 50 years of age. The most common cardiovascular comorbidities were hypertension and hyperlipidemia (48.8%), diabetes (20.93%), and morbid obesity (11.63%). Out of 43 HIV patients with COVID-19, 6 resulted in death (13.95%). All the patients who died were elderly above 50 years and required mechanical ventilation. HIV patients infected with COVID-19 had a high mortality rate. A high burden of pre-existing comorbidities and an advanced age in these patients make them prone to disease progression and worse outcomes.

Keywords COVID-19 · HIV · SARS-CoV-2

Introduction
Coronavirus disease (COVID-19), caused by the novel SARS-CoV-2 virus, was declared a global pandemic by the World Health Organization on 11 March 2020. Earlier it has caused diseases like Middle East respiratory syndrome (MERS) in Saudi Arabia in 2012 and severe acute respiratory syndromes (SARS) in China in 2002. The single-stranded RNA genome virus has overwhelmed the healthcare system all across the world. People living with human immunodeficiency virus (HIV), advanced age (> 60 years), hypertension (HTN), and diabetes mellitus (DM) are at an increased risk of mortality and morbidity. HIV (human immunodeficiency virus) pandemic coexisting with another pandemic like COVID-19 is called syndemic. This group of HIV-positive individuals, who are unable to practice social distancing, have limited access to healthcare, and are prone to drug abuse, will be severely affected. The antiretroviral therapy (ART) has helped in prolonging the lifespan of HIV-positive patients, but the concurrent occurrence of COVID-19 and HIV is presenting unique challenges to the management of these patients. Difficulty in the timely refill of ART medications, a restricted visit to doctors, increased stressors like loneliness, loss of jobs, and fear of homelessness could culminate in substance abuse, a rise in acquired immunodeficiency syndrome (AIDS)-related diseases, and psychiatric problems [1]. The condition could be worse in areas with the already overburdened healthcare system and diversion of public health resources to combat COVID-19. It can make this vulnerable population face unprecedented challenges to maintain their continuity of care [2]. With no cure at hand, practicing social distancing is playing a major role in minimizing the spread of the coronavirus.
infection but can result in decreased adherence to ART therapy and the health outcomes of these patients will take a downhill course [3]. Therefore, we aim to systematically review all published cases of HIV patients with COVID-19 and related clinical correlates and outcomes.

**Methods**

We searched PubMed/Medline, Web of Science, and Scopus until 1 August 2020 for case reports and case series using the following keywords: COVID-19, SARS-CoV-2, HIV, and human immunodeficiency virus. All published case reports included in the final analysis were in the English language. Our search identified 167 studies in total. After removing the duplicates and selecting case reports or case series with individual patient-level data, we found 23 articles. Due to a lack of data, we further excluded 3 articles and finally include 20 articles [4–23]. Continuous variables were presented as means ± standard deviations and categorical data as absolute values and percentages. All data extraction and descriptive analysis were performed using Microsoft Excel.

**Results**

We identified 23 articles through our search from which we excluded 3 due to lack of data. Using 20 articles we selected, a total of 43 patients were analyzed. The mean age of the patients was 51.56 ± 27.56 (range 24–76 years). Of the 43 patients, 30 were male (69.77%), 11 were female (25.58%), and 2 were transgender (4.65%). The race was not included in the analysis due to it not being reported in the data. The majority of the cases were from the USA (58.14%), followed by China (13.95%), the UK (6.98%), Iran (4.65%), South Korea (4.65%), Austria (2.33%), Cyprus (2.33%), Italy (2.33%), Japan (2.33%), and Singapore (2.33%) (Table 1). A total of 25 patients had cardiovascular/pulmonary comorbidities (58.14%), the most predominant one being HTN in 14 patients (32.56%) out of which less than half had hyperlipidemia (HLD). Of 44 patients, 9 had diabetes mellitus (20.93%), 5 had the chronic obstructive pulmonary disease (11.63%), and 3 patients had a history of atrial fibrillation (6.98%).

In terms of presenting symptoms, out of 43 patients, 32 presented with fever (74.42%), 29 presented with cough (67.44%), 9 presented with diarrhea (20.93%), 8 reported headaches (18.60%), 11 had tachycardia (25.58%), 16 had shortness of breath/dyspnea (37.21%), 2 patients had hypoxia (4.65%), 1 reported pneumonia (2.33%), 5 patients presented with fatigue (11.63%), 2 presented with vomiting (4.65%), 1 reported weakness (2.33%), 5 reported myalgia (11.63%), 1 other patient reported anosmia and ageusia (2.33%), and a patient also presented with a sore throat. Of 32 patients who presented with fever, 2 had an upper respiratory tract infection and 3 had a lower respiratory tract infection. Out of the 29 (85.29%) patients presenting with cough, 8 reported having a dry cough.

When looking at the contact history of the 43 patients, 34 patients (79.07%) had no contact history reported. Out of the 9 patients who did have a contact history, 2 denied any sick contacts, 1 had a friend with flu symptoms, 1 had an indirect exposure to a COVID-19-positive patient, 1 of the patients was a pharmacist exposed to COVID-19, another was a sex worker, 1 had dinner 5 days prior with a COVID-19-positive person, another took a trip to Florida, and lastly 1 of the exposed patients was a healthcare worker. There was only one case that reported the meantime from exposure to infection of 12 days. CD4 counts were reported in 32 patients of which, 17 (53.13%) had a CD4 count lower than the normal range (< 500 cells/mm³). Nine (29.03%) of the patients had undetectable HIV-RNA (copies/ml) or viral load. Of 30 cases reporting SPO₂ data, 13 (45.1%) had oxygen saturation less than 95% at the time of admission.

Out of 43 HIV patients with COVID-19, 6 (13.95%) patients died during hospitalization, while the remaining 37 (86.05%) recovered (Table 2). The mean age of the patients that resulted in death was 63.5 ± 12.5 (range 52–76). Of the 6 that died, 5 had bilateral ground-glass opacities on computed tomography scan/chest x-ray, had low oxygen saturation, required mechanical ventilation, and their hospitalization ranged from 1 to 14 days. Of the 37 recovered, 8 patients were on hydroxychloroquine (HCQ) and 1 patient was on chloroquine (CQ). All the patients were on different antiretroviral therapy regimens.

**Discussion**

The key findings of the current review suggest that HIV patients with COVID-19 infection have a high burden of cardiovascular comorbidities. Furthermore, most of the patients were elderly and male. The most common presenting symptoms were fever, cough, and shortness of breath as reported in COVID-19 patients. Besides, the majority of HIV patients with COVID-19 infection were on ART therapy. The patients who did not recover were mostly elderly (> 50 years) and had cardiovascular comorbidities including HTN, DM, or both. A study by Shahid et al. stated that the older COVID-19 patients with comorbidities such as DM have an increased risk of mortality [24]. Of 6 patients who died, 5 received HCQ with some having a combination of HCQ and/or azithromycin (AZM) and/or 3rd-generation cephalosporins. Of the 37 recovered patients, 11 were on ritonavir (RTV), and 8 of which were on lopinavir (LPV) as well. A study by Yu and colleagues found that influenza-coinfected patients taking lopinavir/ritonavir (LPV/r) treatment had faster pneumonia recovery than those who did not [25].
Table 1  Demographics, comorbidities, and presentation of COVID-19 in HIV patients

| Author/year          | Age (years)/sex (M/F) | Country       | Past medical history                                      | Cardiovascular/pulmonary comorbidities | Contact history | Presenting symptoms                                                                 | Meantime from exposure to infection |
|----------------------|------------------------|---------------|-----------------------------------------------------------|----------------------------------------|-----------------|-------------------------------------------------------------------------------------|-------------------------------------|
| Jin Sun et al./2020  | 37/M                   | Singapore     | None                                                      | None                                   | NA              | Fever, sore throat, dry cough, and headache                                        | NA                                  |
| Toombs et al./2020   | 62/M                   | UK            | Renal transplant 2012                                    | HTN                                    | NA              | Dyspnea and a dry cough                                                            | NA                                  |
| Toombs et al./2020   | 46/M                   | UK            | Smoker                                                   | None                                   | NA              | Productive cough and fevers                                                        | NA                                  |
| Toombs et al./2020   | 57/F                   | UK            | Hypertension                                             | HTN                                    | NA              | Dyspnea, a dry cough, fevers, anorexia, and headaches                              | NA                                  |
| Menghua et al./2020  | 49/F                   | China         | Cured syphilis and viral pneumonia                       | None                                   | NA              | Fever, pharyngeal pain, and chills                                                 | NA                                  |
| Giambenedetto et al./2020 | 75/M                 | Italy?        | HIV, hep B                                              | HTN                                    | NA              | High fever, diarrhea, and cough                                                     | NA                                  |
| Choi et al./2020     | 71/M                   | South Korea   | None                                                     | HT                                     | NA              | Fever and cough                                                                    | NA                                  |
| Choi et al./2020     | 67/F                   | South Korea   | None                                                     | None                                   | NA              | Fever and myalgia                                                                  | NA                                  |
| Müller et al. 2020   | 55/M                   | Austria       | HCV, HCC, cirrhosis, and liver transplant                | None                                   | A friend with flu symptom                                                           | 12 days                             |
| Ali asadollahi-amin et al./2020 | 44/M                 | Iran          | Rib fracture                                             | None                                   | NA              | Chest pain and local tenderness                                                    | NA                                  |
| Ridgway et al./2020  | 38/M                   | USA           | None                                                     | DM, HTN, OSA, and obesity              | NA              | Headache, myalgia, SOB, fever, diarrhea, and tachycardia                          | NA                                  |
| Ridgway et al./2020  | 50/F                   | USA           | None                                                     | Obesity                                | NA              | Fever, cough, SOB, and headache                                                    | NA                                  |
| Ridgway et al./2020  | 51/F                   | USA           | Latent tuberculosis                                      | None                                   | NA              | Fever, cough, SOB, and diarrhea                                                    | NA                                  |
| Ridgway et al./2020  | 53/F                   | USA           | Esophageal strictures and bronchoesophageal fistulas     | None                                   | Denied sick contacts                                                             | NA                                  |
| Ridgway et al./2020  | 47/F                   | USA           | HF (LVEF-15%), ICD, PE, and CVA                         | HTN, obesity, and COPD                 | Denied sick contacts                                                             | Chest pain, SOB, tachycardia, abdominal pain, and diarrhoea | NA                                  |
| Haddad et al./2020   | 41/M                   | USA           | Recurrent HSV                                            | None                                   | Indirect exposure to a COVID-19-positive patient                                  | Abdominal pain, vomiting, dry cough, intermittent fever, and confusion | NA                                  |
| Zhu et al./2020      | 61/M                   | China         | DM                                                       | None                                   | NA              | Fever and dry cough                                                                | NA                                  |
| Chen et al./2020     | 24/M                   | China         | Chronic smoker                                           | None                                   | NA              | Fever and dry cough                                                                | NA                                  |
| Author/year | Age (years)/sex (M/F) | Country | Past medical history | Cardiovascular/pulmonary comorbidities | Contact history | Presenting symptoms | Meantime from exposure to infection |
|-------------|------------------------|---------|---------------------|----------------------------------------|----------------|---------------------|-----------------------------|
| Wu et al./2020 | 61/M | China | Pulmonary TB and DM | None | NA | Generalized myalgia, intermittent fever, fatigue, sob, and productive cough | NA |
| Wu et al./2020 | 47/M | China | None | None | NA | Fever, generalized myalgia, sore throat, cough, intermittent shortness of breath, and diarrhea | NA |
| Patel et al./2020 | 58/M | USA | None | None | NA | Weakness, anorexia, and diarrhea | NA |
| Jordanou et al./2020 | 58/M | Cyprus | Influenza A and B | None | NA | Dry cough, malaise, and fever | NA |
| Sadr et al./2020 | 57/F | Iran | None | None | NA | Headache, malaise, and fever | NA |
| Wang et al./2020 | 37/F | China | None | None | NA | Fever, dry cough, chest hypoxia, tachypnea, high BP, and tachycardia | NA |
| Benkovic et al./2020 | 56/M | USA | None | HLD | NA | Trip to Florida | NA |
| Benkovic et al./2020 | 56/M | USA | None | HCV | HTN | Fatigue anemia, ageusia | NA |
| Benkovic et al./2020 | 62/M | USA | None | HCV | HTN, HLD | Fever and fatigue | NA |
| Benkovic et al./2020 | 65/M | USA | AFIB, DM | HTN | HLD | Fever, nonproductive cough, fatigue, and watery diarrhea | NA |
| Blanco et al./2020 | 40/transgender | USA | None | None | NA | Cough, fever, and hypoxia | NA |
| Blanco et al./2020 | 49/M | USA | Hypothyroidism | None | NA | URTI, fever, cough, malaise, headache, and high BP | NA |
| Blanco et al./2020 | 29/M | USA | None | None | NA | LRTI fever, and cough PaO2–182 | NA |
| Blanco et al./2020 | 40/M | USA | Asthma | None | NA | URTI-fever, cough, malaise, and headache | NA |
| Blanco et al./2020 | 31/transgender | USA | None | None | NA | Lower respiratory tract infection-fever, cough, malaise, dyspnea, and tachycardia | NA |
| Suwanwongse et al./2020 | 37/M | USA | Tertiary syphilis | None | NA | Lower respiratory tract infection-fever, cough, dyspnea, and tachycardia | NA |
| Suwanwongse et al./2020 | 31/M | USA | None | Obesity and HLD | NA | Cough, Myalgia, Rhinorrhea | NA |
| Suwanwongse et al./2020 | 70/M | USA | AFIB, HF, HCV, and COPD | HTN and HLD | NA | Dyspnea, cough, fever, and tachycardia | NA |
| Suwanwongse et al./2020 | 76/F | USA | DM | None | NA | Dyspnea, tachycardia, and tachypnea | NA |
| Suwanwongse et al./2020 | 63/M | USA | HTN | None | NA | Cough and fever | NA |
A therapeutic protective role of anti-HIV agents against COVID-19 infections has been reported [15]. Besides this, high mortality (13.95%) was reported in these patients. Of those that recovered, 17 (39.53%) were reported to be taking a combination of tenofovir (TDF) and emtricitabine (FTC) and 3 (6.98%) patients were taking TDF with other combinations of drugs. A study by Amo et al. suggested that HIV-positive patients on treatment with TDF and FTC proved to have a lower risk of COVID-19-related hospitalization [26]. Only 1 out of the 6 patients that did not recover was receiving tenofovir (TDF) and emtricitabine (FTC) as a combination. ART therapy seems to play a crucial role in protecting HIV patients from COVID-19-related hospitalization. However, key challenges have been reported by this high-risk population in timely accessing pre- and post-exposure prophylaxis during this pandemic [27]. Policymakers in different countries have proposed and implemented a support framework at a different level to support HIV patients during the COVID-19 pandemic [27, 28].

Limitations

Limitations associated with this article should be taken into due consideration while drawing any inference. This review only included the case reports or case series with individual patient-level data so the finding could not be generalized. Furthermore, owing to the small sample size, it is not possible to compare the findings between the deceased and survived groups. Besides, data on CD4 count and viral load were missing in a lot of patients which would make it difficult for any subgroup comparison.

Conclusion

In our review, we found that HIV patients with COVID-19 had a high burden of HTN and/or DM and were over the age of 50. The patients who recovered were on a combination of specific ART therapy which was backed up by research in having a protective role against COVID-19 which could have played a role in their recovery. This review gives a glimpse to look deeper into other treatment options such as anti-viral agents like TDF and LPV/r given that the patients over the age of 50 years with HTN and/or DM that did end up recovering were on one or another of these medications.
| Author/year | Age/sex | COVID test | Chest imaging | CT imaging | Rx COVID | Rx HIV | Rx of comorbidity | Mechanical ventilation (intubation) | Hospital stay (days) | Outcome |
|-------------|---------|-------------|---------------|------------|----------|--------|------------------|-----------------------------------|-------------------|---------|
| Jin Sun et al./2020 | 37/M | rRT-PCR | Clear with no infiltrates or consolidation | NA | None due to mild illness, No treatment | TFV, 3TC, RPV | NA | NA | 14 | Recovery |
| Toombs et al./2020 | 62/M | RT-PCR | Bilateral opacities | NA | TZP, AZM, TMP-SMX, PRED | RAL, 3TC, ABC, TAC, mycophenolate | NA | Yes | 8 | Death |
| Toombs et al./2020 | 46/M | RT-PCR | - | NA | LVX, Atovaquone, PRED | TDF/FTC, DTG | NA | Yes | 6 | Recovered |
| Toombs et al./2020 | 57/F | RT-PCR | Bilateral consolidation | NA | DOX, TMP-SMX | TAF/FTC, NVP | NA | Yes | 10 | Recovered |
| Menghua et al./2020 | 49/F | RT-PCR | NA | Ground-glass dense shadow and cord shadow under the pleura of the lateral segment of the middle lobe and a dorsal-base segment of the lower lobe of the right lung | CXM traditional Chinese medicine (Lian-qin oral solution and LianhuaQingwen capsule) Then changed to interferon atomization, ribavirin, Arbidol, and moxifloxacin | EFV, ZDV, 3TC | NA | Yes | 47 | Recovered |
| Giambenedetto et al./2020 | 75/M | RT-PCR | Bilateral signs of interstitial pneumonia Ground-glass opacity in the anterior segment of the RU lobe | Bilateral consolidations and ground-glass opacities | HCQ, AZM = discount later due to cardiotoxicity and conduction disorder Sarilumab IV = recovery after this was administered and HCQ and AZM were discontinued | Darunavir, COB, FTC, TAF | Perindopril for HTN | Yes | 19 | Recovery |
| Choi et al./2020 | 71/M | rRT-PCR | Mild opacity in RLL>>rapidly aggravated bilateral infiltration | NA | HCQ, MPD, day, convalescent plasma, and O2 via a nasal prong | LPV/r | NA | Yes | 26 | Recovery |
| Author/year | Age/sex | COVID test | Chest imaging          | CT imaging | Rx COVID                          | Rx HIV | Rx of comorbidity | Mechanical ventilation (intubation) | Hospital stay (days) | Outcome |
|------------|---------|------------|------------------------|------------|-----------------------------------|--------|------------------|-------------------------------------|---------------------|---------|
| Choi et al./2020 | 67/M    | rRT-PCR    | LLL infiltration       | NA         | HCQ, MPD, convalescent plasma, and oxygen | LPV/r  | NA               | Yes                                  | 24                  | Recovery |
| Müller et al./2020 | 55/M    | PCR        | Diffuse bilateral infiltration | NA         | Antibiotics, immunosuppressives, and oxygen via nasal prongs | FTC TAF RPV | Hemophilia A-factor VIII, HCV-IFN, tacrolimus, mycophenolate, and steroids-2019 | No                   | 6       | Recovery |
| Asadollahi-Amin et al./2020 | 44/M    | rRT-PCR    | NA                     | Patchy ground-glass opacity in the upper lobe of the right lung | LPV/r  | NA               | No                                  | 5                   | Recovery |
| Ridgway et al./2020 | 38/M    | SARS-CoV-2 PCR | Perihilar patchy opacities | Bilateral ground-glass opacities | CRO AZM HCQ | ABC DTG 3TC | NA                                  | 5                   | Recovery |
| Ridgway et al./2020 | 50/F    | SARS-CoV-2 PCR | Mild multi-focal patchy airspace consolidation in the left lower lobe | Oxygen via nasal prongs, AZM, CRO, CDR | BIC FTC TAF | NA | No                                   | 4                   | Recovery |
| Ridgway et al./2020 | 51/F    | SARS-CoV-2 PCR | NA                     | CRO AZM CDR HCQ | ART regimen of elvitegravir, COB FTC and TAF (missed 5 days) | NA | No                                   | 7                   | Recovery |
| Ridgway et al./2020 | 53/F    | SARS-CoV-2 PCR | Unremarkable            | CDR AZM    | BIC FTC TAF RTV DRV TDF FTC | NA | No                                   | 3                   | Recovery |
| Ridgway et al./2020 | 47/M    | SARS-CoV-2 PCR negative on admission, positive on day 3 | Cardiomegaly but no infiltrate | NA | Self-discharged against advice on day 3 | NA | No                                   | 2                   | Recovered |
| Haddad et al./2020 | 41/M    | SARS-CoV-2 PCR negative on admission, positive on day 3 (COVID test positive) | NA | HCQ, AZM, FEP AMP VAN | DTG-3TC | Cefepime, ampicillin, vancomycin, and acyclovir for empiric, bacterial meningitis and herpes encephalitis coverage | Yes | 6 | Recovery |
| Author/year | Age/sex | COVID test | Chest imaging | CT imaging | Rx COVID | Rx HIV | Rx of comorbidity | Mechanical ventilation (intubation) | Hospital stay (days) | Outcome |
|------------|---------|------------|---------------|------------|----------|--------|------------------|-------------------------------------|---------------------|---------|
| Zhu et al./2020 | 61/M | rRT-PCR | NA | Pneumonia with findings of multiple ground-glass opacities (GGO) in bilateral lungs, progressive GGO and consolidation in lungs | MXF γ-globulin MDP and O2 via nasal prongs | LPV/r | Alogliptin co-administered with metformin | No | 21 | Recovery |
| Chen et al./2020 | 24/M | rRT-PCR | NA | Multiple high-density patchy shadows with unclear boundaries in the subpleural regions of the middle and lower lobes of the right lung, with the involvement of adjacent interlobar pleura | Interferon inhalation | LPV/r TFV 3TC EFV | NA | No | 15 | Recovery |
| Wu et al./2020 | 60/M | rRT-PCR | NA | Bilateral multiple ground-glass opacities (GGO), prominent on the right lower lobe | Oxygen OTV MXP CRO and tazobactam | TDF 3TC EFV | CHOP and EPOC-B cell lymphoma TB-INH, rifabutin, ethambutol and moxifloxacin, insulin-DM | No | 14 | Recovery |
| Wu et al./2020 | 47/M | rRT-PCR | NA | Bilateral multiple GGO | Oxygen, MXF RBV umifenovir, YZP SMZ, HCQ AZM, and zinc sulfate | FTC TFV ATVRTV EVG COB FTC TDF | NA | NA | No | 25 | Recovery |
| Patel et al./2020 | 58/M | rRT-PCR | Clear lungs | NA | | | DFA and TAF | NA | No | 5 | Recovery |
| Iordanou et al./2020 | 58/M | rRT-PCR (positive on third swab test on day 6) | Bilateral air space opacifications | Unremarkable | | | CAS enoxaparin | NA | NA | No | 7 | Recovery |
| Sadr et al./2020 | 57/F | RT-PCR | Unremarkable | Multiple infiltrations in both lungs | | | Umifenovir, CS Human serum albumin, thymosin, and ultinastatin Tocilizumab High-flow oxygen (15 l/min) | NA | NA | No | NA | Recovery |
| Wang et al./2020 | 37/M | RT-PCR negative four times. SARS-CoV-2 IgM was positive | | | | | HTN-lisinopril | No | Home isolation | Recovery |
| Benkovic et al./2020 | 56/M | rRT-PCR | NA | NA | FTC TFV etravirine, ABC | HTN-lisinopril | No | Home isolation | Recovery |
| Benkovic et al./2020 | 56/male | RT-PCR | Pneumonia | NA | FTCTFV TAF | Rosuvastatin and losartan | No | Home isolation | Recovery |
| Benkovic et al./2020 | 62/M | RT-PCR | NA | NA | FTCEVG COB TAF | HTN-losartan, DM-metformin, | No | 14 | Recovery |
| Author/year | Age/sex | COVID test | Chest imaging | CT imaging | Rx COVID | Rx HIV | Rx of comorbidity | Mechanical ventilation (intubation) | Hospital stay (days) | Outcome |
|-------------|---------|------------|---------------|------------|----------|--------|------------------|--------------------------------------|---------------------|---------|
| Benkovic et al./2020 Recovery | 65/M | RT-PCR | NA | NA | NA | TAF FTC | HLD-atorvastatin, and AFIB-Coumadin DRV-boosted COB | NA | No | 1 |
| Blanco et al./2020 Recovery | 40/transgender | PCR | Normal | NA | NA | TAF FTC | DRV-boosted COB | NA | No | 1 |
| Blanco et al./2020 | 49/M | PCR | Bilateral ground-glass opacities | NA | Interferon beta-1b, HCQ, MEM LTD tocilizumab | ABC 3TC DTG TDF FTC LPV/r | NA | Yes | 21 |
| Recovery Blanco et al./2020 | 29/M | PCR | NA | NA | HCQ, AZM | TAF FTC | DRV-boosted COB TDF FTC LPV/r | NA | No | 3 |
| Recovery Blanco et al./2020 | 40/M | PCR | Right basal interstitial infiltrates | NA | AZM, CFM HCQ, inhaled corticosteroids | ABC 3TC DTG TDF FTC LPV/r TAF FTC | NA | No | 4 |
| Recovery Blanco et al./2020 | 31/transgender | PCR | Right basal pneumonia with pleural effusion | NA | Interferon beta-1b and HCQ, AZM, CPT TMP-SMX, and corticosteroids | DRV-boosted COB | NA | No | 12 |
| Recovery Suwanwongse et al./2020 | 37/M | RT-PCR | Normal | NA | Symp Trt. No antibiotics | FTC, TAF, and DTG | NA | No | 1 |
| Recovery Suwanwongse et al./2020 | 31/M | RT-PCR | Bilateral multifocal infiltrates | NA | Symp Trt. No antibiotics | EVG, FTC, TAF, and COB-compliant | NA | No | 3 |
| Suwanwongse et al./2020 | 70/M | RT-PCR | Bilateral ground-glass opacities | NA | HCQ, AZM CF3 | FTC, TDF, and RAL-compliant | NA | Yes | 12 |
| Death Suwanwongse et al./2020 | 76/F | RT-PCR | Bilateral ground-glass opacities | NA | HCQ CF3 | FTC, TAF, ATV, and COB-compliant | NA | Yes | 7 |
| Death Suwanwongse et al./2020 | 63/M | RT-PCR | Bilateral ground-glass opacities | NA | HCQ AZM CF3 | FTC, TAF, and DTG-compliant | NA | Yes | 13 |
| Death Suwanwongse et al./2020 | 52/M | RT-PCR | Bilateral ground-glass opacities | NA | HCQ | EVG, FTC, TAF, and COB-non compliant | NA | Yes | 1 |
| Author/year | Age/sex | COVID test | Chest imaging | CT imaging | Rx COVID | Rx HIV | Rx of comorbidity | Mechanical ventilation (intubation) | Hospital stay (days) | Outcome |
|-------------|---------|------------|---------------|------------|----------|--------|------------------|-------------------------------------|---------------------|---------|
| Death       |         |            |               |            |          |        |                  |                                     |                     |         |
| Suwanwongse et al./2020 | 58/M    | RT-PCR     | Bilateral interstitial infiltrates | NA         | HCQ, AZM CF3 | HARRT-not taking | NA                        | Yes                   | 14       | Death   |
| Suwanwongse et al./2020 | 52/M    | RT-PCR     | Bilateral multifocal infiltrates | NA         | COVID treatment-none | FTC, TDF, and DTG-compliant | NA                       | No                    | 3        | Recovery |
| Suwanwongse et al./2020 | 76/F    | RT-PCR     | Bilateral multifocal infiltrates | NA         | AZM      | EFV, FTC, and TAF-compliant | NA                       | No                    | 5        | Recovery |
| Nakamoto et al./2020 | 28/M    | Not mentioned | NA | Multiple GGO | HCQ      | NA      | NA               | NA                       | No                    | 8        | Recovery |

Abbreviations: ABC, abacavir; ACV, acyclovir; AMP, ampicillin; ATV, atazanavir; AZM, azithromycin; BIC, bictegravir; CAS, caspofungin; CDR, cefdinir; FEP, cefepime; CFM, cefixime; CFP, cefoperazone; CRO, ceftiraxone; CVM, cefuroxime; CPT, cefotaxime; CF3, 3rd generation cephalosporins; COB, cobicistat; DRV, darunavir; DTG, dolutegravir; DOX, doxycycline; EFV, efavirenz; EVG, elvitegravir; FTC, emtricitabine; EMB, ethambutol; ETR, etravirine; GEN, gentamicin; HCQ, hydroxychloroquine; LZD, linezolid; LPV/r, lopinavir/ritonavir; MEM, meropenem; MXF, moxifloxacin; NVP, nevirapine; OTV, oseltamivir; SUL, sulbactam; TZP, piperacillin/tazobactam(tazocin); Pred, prednisone; RAL, raltegravir; RFV, ritonavir; RPV, ritonavir; RTV, ritonavir; 3TC, lamivudine; LVX, levofloxacin; RBV, ribavirin; TAC, tacrolimus; TAF, tenofovir alafenamide; TFV, tenofovir; TDF, tenofovir disoprophil fumarate; TAF/FTC, tenofovir alafenamide/emtricitabine (Descovy); TDF/FTC, tenofovir disoprophil fumarate/emtricitabine (Truvada); TMP/SMX, trimethoprim/sulfamethoxazole (co-trimoxazole); VAN, vancomycin; ZDV, zidovudin; NA, not available; Symp, symptomatic; Trt, treatment; GGO, ground glass opacity; RT-PCR, reverse transcriptase-Polymerase Chain Reaction
Compliance with Ethical Standards

Conflict of Interest  The authors declare that they have no conflict of interest.

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