# HIV AND SARS COV-2 CO-INFECTION: A SYSTEMATIC REVIEW

**Abstract**

**Introduction**: COVID-19 consequences are more likely to affect patients with co-morbidities. According to the recent research, HIV positive individuals are not at a higher risk for COVID-19 than the general population. This systematic study was done to find out how COVID-19 affected individuals who were HIV-positive.

**Aim**: The study was aimed to conduct a systematic assessment of recent research papers that examined the effects of co-infection with SARS-COV 2 and HIV.

**Materials and Methods**: PRISMA standards were followed to conduct a systematic review. A thorough literature search was done in Web of Science, Medline, Google Scholar, Pubmed, Pubmed Central using key words and headings related to HIV and Covid-19 co-infection.

**Results**: After removing duplicate entries, 100 articles were found. Following screening, 14 studies with a total of 148 HIV-infected patients were evaluated. Further research is needed to determine the prognosis of Covid-19 patients, and because co-infected individuals have impaired immune systems, they should be checked for opportunistic infections.

**Conclusion**: According to the recent studies and current review it was found that patients with less severe Covid-19 symptoms had normal cd4 count. As of now, co-infection with Covid-19 is not thought to be a danger with a well-managed HIV infection. So, more studies are required in this field to identify why patients with low Cd4 count experiences more severe infections.

**Keywords:** HIV, SARS COV 2

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## I. INTRODUCTION

In the Wuhan city, China, the Severe Acute Respiratory Syndrome Corona virus 2 (SARS COV-2) was first surfaced and the city experienced Corona Virus Disease (COVID) in December, 2019, which is the most calamitous pandemic in the modern era.[1] Its considered as an global emergency because of its high rate of mortality and rapid expansion.[2] "The World Health Organization (WHO)" designated the novel Corona Virus as "COVID 19" (Corona Virus Disease 19).[3] The World Health Organisation (WHO) proclaimed Covid-19 a pandemic in March 2020 as a result of the widespread distribution and deaths of thousands people throughout the world caused by Covid 19, corona virus disease.[4] The SARS COV-2, beta corona virus which belongs to the Coronaviridae family, has genomic size of roughly 29 kb. [5] Clinical symptoms can be symptomatic or asymptomatic which is subdivided into presymptomatic or asymptomatic infection, mild illness, moderate illness, severe illness and critical illness. Dry cough and fever considered as the first appeared symptoms in persons infected with SARS COV-2. Individuals with asymptomatic infection can be positive by Antigen test or NAAT (Nucleic Acid Based Amplification Test) with no signs and symptoms. Fever, dry cough, headache, muscle pain, sore throat considered as the mild illness. $SpO_2$>94% along with LRTI considered as the moderate illness, $SpO_2$<94 and respiratory breath 30 breaths/min considered as the severe illness, respiratory failure, septic shock and multiple organ failure considered as the critical illness [6,7] . In addition to respiratory syndrome, COVID-19 may result in cardiac complications, neurological manifestations such as headache, dizziness, intracranial haemorrhage and stroke [8,9,10]. However, there is a growing evidence which demonstrate that diabetes, age and hypertension considered as risk factors which are associated with less favourable outcomes. [11,12] As of now, it remains unclear why HIV reactive patients are at a higher risk than healthy individual. [13,14] Chronic immunosuppression, decreased function of mucosal barrier, and CD4 T cell loss are all consequences of HIV infection.[15] Several inflammatory factors, including gut microbial translocation, cause impaired CD4 T cell regeneration and persistently elevated CD8 T cell counts. Translocation of the gut microbiota is one of the inflammatory mechanism that results in persistently high CD8 T cell numbers and reduced CD4 T cell regeneration. [16,17] In HIV infected patients, there is a decline in CD4 T cell count, which if left untreated turns to AIDS.[18,19] According to WHO, "Acquired Immunodeficiency Syndrome is the most advanced stage of the disease" [20].According to Centers for Disease Control and Prevention (CDC), AIDS defines "when the CD4 cell count falls below 200 cells/$mm^3$ or the presence of AIDS defining illness" [21]. There is no information on how HIV affects SARS-CoV-2 infection and whether it has any impact on COVID-19 results. The purpose of this systematic review is to locate the studies which addressed HIV patients who had contracted SARS-COV-2 and reported if co-infection increases the probability of negative outcomes.

## II. MATERIALS AND METHODS

1. **Search Strategy:** A thorough literature review has been executed in PubMed, PubMed Central, Science direct, web of science, Elsevier, Google Scholar to identify why individuals with HIV have a higher risk of contracting SARS-COV 2 infection and what happens to patients who have both infections since they have impaired immune systems in accordance with PRISMA guidelines.

 

2. **Eligibility Criteria:** Studies discussed both HIV and SARS COV-2 infection were included in the study. Studies which discussed other co-infections rather than SARS-COV 2 were excluded from the study.

3. **Data Extraction:** Two authors independently reviewed each paper and the extracted data. Data was validated by the second author.

4. **Statistical Analysis:** Due to lack of research data in this topic, a suitable meta analysis could not be carried out.

## III. RESULTS

| First author and Publication year | Article Title | Location | Study design | Population | Outcome |
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| Sun LJ *et al* , 2020 [22] | "A case of HIV and SARS-CoV-2 co-infection in Singapore." | Singapore | Case study | SARS COV-2 and HIV co-infected patient. 37 years/Male | Patient came with the complaints of having sore throat, fever (38℃) and headache from last 6 days. He had a travel history (returned from Paris and London 1 day before the onset of symptoms). Background medical history: Chronic HIV and the patient was on ART treatment. CBC count, LFT, RFT was normal. RT-PCR was positive for SARS COV-2. After 14 days of isolation and treatment patient recovered and RTPCR came negative. |
| Feng Zhu *et al*, 2020 [23] | "Co-infection of SARS-COV-2 and HIV in a patient in Wuhan city, China." | Wuhan, China | Case study | SARS COV -2 and HIV co-infected patient.63 years/Male | From 2 days For ,the patient fever and a dry cough. SARS COV-2 pneumonia was confirmed from Chest CT report, bilateral lung opacities associated with ground glass was found. Background history: Type 2 Diabetes mellitus. RTPCR was positive for SARS COV 2. |

 

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| | | | | | Lymphopenia with low lymphocyte count and 4.75% CD4+ T lymphocyte was reported. Antigen/antibody combination test was positive for HIV and ART treatment started(Lopinavir, Ritonavir) along with Moxifloxacin 400 mg. After 18 days of symptoms RTPCR was done and came negative and the very next day patient discharged. |
| Kulachanya *et al* ,2020 [24] | "Clinical features and outcome of HIV/SARS-CoV-2 co-infected patients in The Bronx, New York city." | New York | Case Series | 9 HIV patients co-infected with SARS COV-2. | All the patients belong to The median age range of 31-76. Out of which 7 were males and two were females. A positive RT PCR test confirmed the infection of SARS COV-2. CD4+ T cell count in the most recent patients ranges from 179-1827 mm3. In all patients, Very low to undetectable HIV viral loads were seen. Eight patients were receiving highly active antiretroviral therapy (HAART), and six of them reported medication adherence.. In four patients, HAART was discontinued. All patients represented with fever, cough, dyspnea. GIT symptoms were present on one patient. Eight patients (89%) had abnormal chest X-rays (CXR) that were consistent with COVID-19 pneumonia, and the severity of the disease |

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| | | | | | corresponded with these abnormalities. Seven patients died (78%), seven of them from multi organ failures and septic shock, with three patients dying from septic shock and four patients dying from hypoxemic respiratory failure. |
| Yifei Hu *et al,* 2020 [25] | "Coinfection With HIV and SARS-CoV-2 in Wuhan, China: A 12-Person Case Series." | Wuhan, China | Case series | 12 HIV infected patients co-infected with SARS-COV 2 | 12 HIV infected patients(10 men and 2 women) , age range of 25-66 years represented with the mild COVID-19 symptoms. Out of 12 patients, one patient died at home early when healthcare systems was over burdened. two patients, aged 25 years and 37 years, was admitted in ICU with acute COVID-19, both the patients were on ART treatment. With the exception of deceased person, 6 out of 11 co-infected patients reported experiencing depression despite clinical improvements. |
| Benkovic S *et al* , 2020 [26] | "Four cases: Human immunodeficiency virus and novel coronavirus 2019 Co-infection in patients from Long Island, New York." | Long Island, New York | Case series | 4 HIV infected patients co-infected with SARS-COV 2 | 4 HIV infected patients diagnosed with SARS COV-2. All 4 patients were on ART regimen. Presented with the symptoms of fever, fatigue, anosmia, ageusia, cough and diarrhea. Out of 4 patients 3 patients were on home isolation and 1 patient was hospitalized for 2 weeks. |
| Ridgway JP *et al,* 2020 [27] | "A Case Series of Five People Living with | USA | Case series | 5 HIV infected patients co | 5 HIV diagnosed patients came positive for SARS COV-2. The patients |

 

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| | HIV Hospitalized with COVID-19 in Chicago, illinois." | | | infected with SARS-COV 2. | were between the age range of 38-53. The patients represented with shortness of breath, fever and cough. Three patients experienced diarrhea. All patients were on ART treatment with a reduced HIV viral load and CD4 cells >200 cells/mm3. All five patients were admitted to the hospital, supplemental oxygen was required for two patients and all patients were recovered after a median stay of 3 days. |
| G Härter *et al* ,2020 [28] | "COVID-19 in people living with human immunodeficiency virus: a case series of 33 patients." | Germany | Case series | 33 HIV infected patients co-infected with SARS COV-2. | 33 HIV infected patients came positive for SARS COV-2. 48 years was the mean age of the patients. All patients were on ART treatment. Prior to SARS-CoV-2 infection, the median CD4+ T-cell count was 670/mm3. In 30 patients, HIV viral load was below 50 copies/mL. Coughing was the predominant symptom, followed by fever , arthralgia/myalgia, headache and sore throat. Out of 33, 14 patients were admitted in hospitalized, out of which 6 patients were on ICU. |
| Patel RH *et al*, 2020 [29] | "COVID-19 in a patient with HIV infection." | Florida | Case study | HIV patient co-infected with SARS COV-2. 58 year/Male | Patient represented with the complaints of having weakness, diarrhea, anorexia for 2 weeks. Patient had chronic bronchitis and hypertension and HIV. Patient was on ART regimen. The CD4 cell |

 

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| | | | | | count was 497 cells/mm3. The patient was hospitalized and RT PCR was positive for SARS COV-2. Fever was lasted for 94 hours with a temperature of 37°C. After 5 days patient was discharged and advised home isolation for 14 days. |
| SR Nagarakanti *et al*, 2020 [30] | 'Clinical outcomes of patients with COVID-19 and HIV coinfection." | USA | Case series | 23 HIV infected patients co-infected with SARS COV-2. | 23 patients diagnosed with HIV admitted to hospital. Those patients also came positive for SARS COV-2. The median age of the patients was 59 years. Out of 23, 3 patients presented with AIDS. |
| KCS Suryana *et al*, 2021 [31] | "Coinfection between SARS-CoV-2 and HIV with a low CD4+ T-cells count" | Indonesia | Case report | HIV patient co-infected with SARS COV-2. 32 year/Male | The patient was hospitalized with the symptoms of having dry cough, shortness of breath and fever from 3 days. Bilateral infiltration in the lungs was observed in the Chest X-ray. The patient had a weight loss and fever and based on this counselling done and HIV infection was confirmed. SARS-COV 2 infection was confirmed by the RT PCR assay. ART treatment, antibiotics and vitamins was given to the patient. After more than 14 days of hospitalization the patient was discharged. |
| Yang *et al*, 2020 [32] | "The reflection on an AIDS patient with asymptomatic COVID 19." | Wuhan, China | Case report | HIV patient co-infected with SARS COV-2. 29 year/Male | Patient was HIV reactive and on ART treatment. Hospitalized for chemotherapy for kaposi's sarcoma. Both nasopharyngeal swab and throat swab came |

 

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| | | | | | positive for SARS COV-2 by RT PCR assay. The patient had no symptoms of COVID-19 but quarantined in the hospital and recovered without treatment. |
| Vizcarra P *et al*, 2020[33] | "Description of COVID-19 in HIV-infected individuals: a single-centre, prospective cohort." | Madrid, Spain | Case series | 51 HIV infected individuals co-infected with SARS-COV 2 | 51 HIV infected individuals co-infected with SARS-COV 2. 6 patients were admitted in ICU. All patients patients were on ART treatment and had mild COVID-19 symptoms. |
| Zhao *et al*, 2020 [34] | "Early virus clearance and delayed antibody response in a case of COVID-19 with a history of co-infection with HIV-1 and HCV." | Shenzhen, China | Case report | HIV and SARS COV-2 co-infected patient. 38 years/male. | Patient hospitalized with the symptoms of fever (37.2 ℃). Right lower pneumonia was detected in chest CT. RT PCR came negative 3 consecutive times for SARS COV-2. Later, the patient tested positive for IgM IgG antibodies for SARS COV-2. Patient recovered fully without the need for ventilator or ICU hospitalisation. The patient also had a history of HIV-1 and HCV co-infection. |
| Blanco *et al*, 2020 [35] | "COVID-19 in patients with HIV: clinical case series" | Barcelona, Spain | Case series | 5 HIV infected patients co-infected with SARS COV-2. Median age < 50. | All the patients had fever, cough, dyspnea and malaise. All were on ART treatment. Out of 5, 2 patients were admitted in ICU. All the 4 patients recovered and one patient was in ICU. One patient had *pneumocystis jiroveci* infection which was treated by antibiotics. |

## IV. DISCUSSION

In late 2019's SARS COV-2, belongs to the genus Sarbecovirus the causative agent of COVID-19 first detected in a bunch of pneumonia patients in Wuhan, China [36]. Local hospitals in Wuhan discovered the novel coronavirus, SARS-COV 2. WHO declared Covid-19 as a "Public Health emergency of international concern"[37,38]. **Wang *et al*** included 138 patients in his one month of case series where the mean incubation period ranges from 5 days to 8 days [39]. One of the most important things to consider is how COVID-19 is relate to other infectious disease, most importantly HIV. As of now, there are very minimal proof on the affect of HIV on COVID-19 [40]. **KM Byrd *et al*** included 27 HIV diagnosed patients co-infected with SARS-COV 2 in his study. All patients were on ART treatment and had a HIV viral load of <200 copies/ml. CD4 count of the patients ranges from 87-1441 cells/µl. Out of 27, 26 patients had mild common symptoms. 9 patients were admitted to hospital, out of those 3 patients were on nursing home and though clinical trial remdesivir was given to 6 patients. However, 8 patients fully recovered and discharged and 1 patient died [41]. **A Parker *et al*** studied a case report of 41 year old patient who was HIV infected and was on ART from 2016 and low, undetectable HIV viral load from last 6 months. Clinical symptoms includes fever, myalgia, diarrhea. Chest radiograph shows diffuse bilateral ground glass infiltrates with patchy areas. The patient was admitted in ICU as differential diagnosis confirmed COVID-19 pneumonia and presence of SARS-COV 2 was confirmed by PCR from endotracheal aspirate [42]. **S Karmen *et al,*** included 21 HIV infected patients co-infected with SARS COV-2 in their over one month of study. All the patients were hospitalized with high CRP values. Despite the fact, along with the clinical course, peak levels in HIV reactive patients are frequently high. Three patients died due to concurrent bacteria pneumonia during hospitalisation [43]. **Vizcarra P *et al***, conducted a prospective cohort study. 51 HIV infected patients (mean age of 53.3 years) co-infected with SARS COV-2 were included in the study. Out of 51, 8 were female and 43 were male. 28 patients were admitted to hospital, out of which 22 non-critical and 6 critical. All patients were on ART and had fever, non productive cough, fatigue and dsypnoea. 23 patients (45%) were managed ambulatorily. 6 patients were admitted in ICU. 44 patients were recovered and 5 were in hospital [33].

## V. CONCLUSION

Although the evidence is limited, the present review demonstrates that patients with low or undetectable HIV viral loads have a normal/high CD4 count. Most of the patients who have been on ART for a long time experienced mild to moderate symptoms. In some patients, co-morbidities like Type 2 diabetes mellitus, chronic bronchitis, hypertension causes alteration of the symptoms. The death of some patients is due to multiple organ failure or septic shock. The analysis therefore comes to the conclusion that the likelihood of having COVID-19 of a more severe kind is not increased by properly controlled HIV infection. However, it is unclear if inadequately managed HIV and AIDS increase the risk of developing COVID-19 of a severe na However, it is not clear whether poorly controlled HIV and AIDS enhance the chance of getting COVID-19 in a more severe nature. Our findings thus emphasise the need for additional and ongoing study to fully understand how HIV infection affects COVID-19.

 

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