Review Article

SARS, MERS, and COVID-19 status in HIV-Positive Patients: A Systematic Review

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Abstract

Coronavirus can cause lots of viral diseases such as the common cold, novel coronavirus disease, severe acute respiratory syndrome coronavirus, and middle east respiratory syndrome coronavirus. Coronavirus and Human immunodeficiency virus (HIV) is considered RNA viruses. The use of antivirals in HIV-positive patients challenges the treatment process of the patients with SARA, MERS, and COVID-19. We reviewed the relevant studies in this regard to identify the status of COVID-19, MERS, and SARS in HIV-positive patients. According to this review, patients with HIV are not at risk for developing MERS, SARS, and COVID-19, but CD4<200 cells may increase the risk slightly. It should be noted that there is no difference regarding clinical signs, mortality, and length of the COIVD-19, SARS, and MERS in patients with HIV.

Keywords: MERS, COVID-19, SARS, HIV

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Introduction

Coronavirus is a common human-animal disease (Zoonosis) (1). Coronavirus as a large family of viruses causes a wide range of viral illnesses such as Severe acute respiratory *syndrome* coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV), common cold, and novel coronavirus disease 2019 (COVID-19) (2-5).

SARS in China in 2002, MERS in Saudi Arabia in 2012, and COVID-19 in Wuhan, China in late December 2019 had their first appearance (5, 6). Like the Human immunodeficiency virus (HIV), coronaviruses are a family of RNA viruses causing illness in birds and mammals (7). Both viruses involve various organs including kidneys frequently. Renal involvement comprising interstitial infiltration and fibrosis, tubulopathy, and glomerular disease (8-10).

HIV is the etiology of AIDS, an immunodeficiency disease currently affecting more than 37 million people with a high number of victims each year (11), the patients are theoretically more prone to opportunistic diseases and COVID-19 due to a weakened immune system (12); however, according to the recent studies, they have a lower incidence of

Table 1: Summary of selected studies in this systematic review.

COVID-	Author	Country	N	Conclusion
19 & HIV	Algarin et al., 2020 (15)	USA	16	Three participants experienced one potential symptom indicating COVID-19 which was a productive cough in the two patients and a dry cough in one patient.
	Altuntas et al., 2020 (6)	Turkey	1.224	In this study, four patients had COVID-19 approved by a positive nucleic acid test. Radiological changes were observed in all HIV patients, even in the patients who had low CD4.
	Ballester-Arnal et al. , 2020 (12)	Spain,	5	HIV-positive patients who had CD4 > 200 were at risk to develop COVID-19 as equal to healthy people who had no HIV infection.
	Blanco et al, 2020 (14)	Spain,	5	Patients with HIV accounted for almost 1% of COVID-19 cases who required hospital admission. Also, it was observed the infection in MSM (men who have sex with men) people younger than 50 years.
	Chen et al., 2020 (16)	China	1	The HIV patient had a kind of lung involvement related to COVID-19. Chest X-ray revealed quick absorption of pulmonary lesions.
	Harter et al., 2020 (20)	Germany	33	In this study, 76% of the cases were mild. Mortality and hospitalization were higher than healthy people. One out of four patients with AIDS (low CD4 T-Cell counts) died.
	Guo et al., 2020 (21)	China	18	All infected patients had normal CD4 counts and normal status.
	Wang et al., 2020 (22)	China	37	HIV patient discharged without the need for ICU or mechanical ventilation.
	Zhao et al, 2020 (23)	China	38	HIV patient had full recovery without the need for ICU or ventilation.
	Yang et al., 2020 (24)	china	29	The patient fully recovered from COVID-19 without specific treatment but was quarantined in the hospital.
	Karmen et al., 2020 (25)	USA	63	There was no significant difference in the need for oxygen therapy, admission to ICU, and ventilation between the HIV-negative and positive patients. There were four patients with superimposed bacterial pneumonia consisting of three HIV positive and one HIV negative and all four patients expired.
SARS & HIV	Zhu et al., 2020 (26)	China	1	HIV-positive patients who developed COVID-19-related pneumonia recovered but these patients must be under observation.
	Mak et al., 2006 (27)	Hong Kong	3011	Public stigma was the highest towards HIV/AIDS and then SARS. Psychological effects of stigma worsen the infection in these patients.
	Kliger and Levanon, 2003 (28)	Israel	-	This study revealed that anti-viral drugs can be adopted both from HIV-1 to SARS-CoV.
MERS & HIV	Shalhoub et al., 2015 (29)	Saudi Arabia	1	Recovery of MERS was observed successfully in the HIV-positive patient who developed pneumonia.

SARS, CoV-MERS, and COVID-19 are very low (13-15).

In a study in Florida, USA, out of 16 AIDS patients suspected of having COVID-19, only three had symptoms of persistent and dry cough (15) and in another study in Istanbul, Turkey, among patients with AIDS only four people were involved with COVID-19 (6).

In Barcelona, Spain, two weeks after the spread of the COVID-19, only five people with AIDS became infected with the COVID-19, none of whom died, and only one needed to be admitted to the intensive care unit (10). Chen et al. also found in their study that people with AIDS who are being treated with antivirals show milder symptoms if they develop COVID-19 (16). Their studies found that AIDS patients with a CD4 count of more than 200 were prone to develop severe COVID-19 as non- AIDS patients (12).

Additionally, antiviral therapies have a protective role for these people against viral diseases such as the coronavirus family (13-16). Considering that the spread of COVID-19 transmission is high (17) and there is no census regarding its novel treatment (18, 19) and no study has been conducted to examine the status of this family in patients with AIDS, this study was performed to systematically review the status of SARS, MERS, and COVI-19 in HIV-positive patients in Iran and the world.

Study design and search strategy: this systematic review study was approved by the ethics committee of the Alborz University of Medical Science (#IR.ABZUMS.REC.1399.040). The design of the study question was based on the PICO process, in which "p" was patients with HIV, "I" referred to infected with SARS, MERS andCOVID19, "C" referred to rate of infection, and "O" referred to SARS, MERS andCOVID-19 developments.

To access all published articles on the subject of SARS, MERS, and COVID19 in People living with HIV searching process were done in the SCOPUS, Web of Science, Google Scholar, Embase, and PubMed databases using MESH and EMTREE by three independent researchers. The keywords studied include:

AID --acquired immunodeficiency syndrome-SARS-HIV-Severe acute respiratory syndrome-human immunodeficiency virus MERS--the Middle East respiratory syndrome-2019-nCoV- COVID-2019 and COVID-19.

An example of a search strategy in PubMed is given as follows:

((((AIDS [Title/Abstract] OR HIV [Title/Abstract] OR Human immunodeficiency virus [Title/Abstract] OR Acquired immunodeficiency syndrome [Title/Abstract] OR Acquired Immunodeficiency Syndrome [MeSH Terms])) AND ((SARS Virus [MeSH Terms] OR Severe Acute Respiratory Syndrome [Title/Abstract] OR SARAS-Cov [Title/Abstract] OR SARS coronavirus [Title/Abstract]))) OR (((AIDS [Title/Abstract] OR HIV [Title/Abstract] OR Human immunodeficiency virus [Title/Abstract] OR Acquired immunodeficiency syndrome [Title/Abstract] OR Acquired Immunodeficiency Syndrome [MeSH Terms])) AND ((Middle East Respiratory Syndrome [MeSH Terms] OR MERS [Title/Abstract] OR MERS-Cov [Title/Abstract])))) OR (((AIDS [Title/Abstract] OR HIV [Title/Abstract] OR Human immunodeficiency virus [Title/Abstract] OR Acquired immunodeficiency syndrome [Title/Abstract] OR Acquired Immunodeficiency Syndrome [MeSH Terms])) AND ((COVID-2019 [MeSH Terms] OR COVID-2019 [Title/Abstract] OR 2019-nCoV [Title/Abstract] OR COVID* [Title/Abstract] OR SARS-CoV-2 [Title/Abstract])))

In this systematic review, articles were included that were cross-sectional studies conducted in English and were published between 2000 – 2020. If it is not possible to access the full text of the article, lack of relevancy to our purposes, written in other languages, and duplication, the articles were deleted. The three researchers searched the databases separately and reviewed the titles and abstracts of the articles in terms of inclusion and exclusion criteria. The full text of the articles was then reviewed to make sure they were relevant.

Table 1 presents the number of studies performed on the *people* with *HIV-AIDS who* developed COVID-19, MERS, and SARS. There was no study about MERS and COVID-19 but a case report.

The status of MERS in patients with AIDS is unknown because so far it has not been reported in

HIV-positive patients. There is only a case report indicating the normal status of MERS in patients with AIDS (20). Therefore it is challenging whether MERS plays a protective role or not. Lack of reporting trends to protective effects of MERS in patients with AIDS. Indeed the clinical display of MERS CoV pneumonia in patients with AIDS is similar to non-HIV infected patients (21).

Due to the unknown nature of COVID-19, the effect of COVID-19 in the affected patients was reported in case reports. Carrico AW et al. (20), revealed that the co-occurrence of HIV and *N*-methylamphetamine use could create double jeopardy for COVID-19 in men who have sex with men (MSM) (22).

Drain PK et al. (23) showed that having AIDS may prevent the trigger of cytokine release syndrome or develop severe respiratory involvement following COVID-19 (24). COVID-19 increases the risk of the mental health of HIV-positive women in South Africa. In Africa, COVID-19 development can increase anxieties related to potential infection with COVID-19, decrease access to care and medication adherence, and increase the rates of domestic violence. For women on antiretroviral therapy who are still able to access HIV care, psychological treatment should be available (25).

Jiang H et al. indicated that as the COVID-19 pandemic is going to spread worldwide, lots of areas encounter the risk of SARS-CoV-2. During the epidemic, HIV cares must be performed as usual (26).

HIV-positive patients need to be considered as vulnerable individuals to develop COVID-19. Nevertheless, there is no identified interrelationship between the two viral infections.

Despite there are many HIV-positive patients and the COVID-19 pandemic covers a large area in Asia, but HIV-positive patients are not getting COVID-19 (27), in such a way that Thailand following China, but no case of infection was reported for a while among HIV-positive patients given that HIV was prevalent over there.

We know that people living with HIV (PLWH) are about 38 million in the world (28). South Africa which HIV can be found in 20% of adults has reported its first patient with COVID-19 on 5 March 2020 (29).

Low incidence of COVID-19 in HIV-positive patients reveals the protective effect of antivirals that are used by PLWH. But for influenza, the PLWH are at risk for severe respiratory failure that is challenging because influenza has the nature of coronavirus (30). Regarding MERS and SARS, HIV-infection is not considered as a risk factor for SARS and MERS in large cohorts (30-33). Also, it should cautiously be said that worse outcomes in HIV-positive patients who have low CD4 counts might be more (34).

In another systematic review done by Cooper et al., PLHIV is not at risk of COVID-19 disease outcomes compared to healthy people (35). Studies about SARS and MERS in recent years suggest that patients with HIV often have lower risks of infection or severe disease, that is why antiviral therapy is done for them, but people with comorbidity, lower CD4 count might be at an increased risk of COVID-19 (13, 35-37). However, the underlying mechanisms of COVID-19, especially the immunologic basis of the disease mandates much more studies (38-40).

Conclusion

According to a comprehensive review, HIV-positive patients are not at increased risk for MERS, SARS, and COVID-19, and only in cases that the CD level is less than 200 may the risk increase slightly, but regarding clinical signs, mortality, and length of the disease, no significant difference could be mentioned yet.

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None.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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