

Table 1: Immunosuppressant Drugs Therapies with COVID-19: Associated Risks, Adverse Reactions and Drug-Drug Interactions

Immunosuppressant Drugs	Associated Risks with COVID-19	Adverse Reactions	Drug-Drug Interactions
Etanercept	Infectious complications in patients suffering with rheumatoid and immune diseases. Follow CDC guidelines and continue immunosuppressive medications unless infection present [11]	It can cause adverse reactions in patients suffering from Psoriatic Arthritis, Ankylosing Spondylitis, Rheumatoid Arthritis, Plaque Psoriasis etc [13].	Drug-drug interactions with Anakinra (a drug for rheumatoid arthritis) leading to serious infection. Not recommended with Cyclophosphamide in Wegener's Granulomatosis patients as it can lead to non-cutaneous solid malignancies [13]
Mycophenolate Mofetil	Oversuppression of the immune system can give rise to infections and make immunocompromised and transplant patients susceptible to COVID-19 with complications. It is advised to continue the medications as the benefits outweigh	It can cause development of lymphoma or lymphoproliferative disease in renal, cardiac and hepatic transplant patients. It can also lead to fatal progressive multifocal leukoencephalopathy (PML) [15]	Drug-Drug interactions can reduce concentration of Mycophenolate Mofetil with antacids containing aluminium and magnesium hydroxide (Maalox TC). It should not be used with live attenuated vaccines as it may be less

	the risk [18-19]		effective [15, 17]
Sirolimus	<p>Patients taking immunosuppressant drugs are more susceptible to COVID-19 specifically those suffering from underlying lung disease. It also reduces lung function (FEV1: forced expiratory volume) [22]</p>	<p>It can cause adverse reactions in renal transplant by causing peripheral edema, hypertension, creatinine increase, urinary tract infection, hypertriglyceridemia etc. It causes stomatitis, abdominal pain, nasopharyngitis in patients suffering with Lymphangioleiomyomatosis (LAM - growth of smooth muscle cells in lungs, lymphatics, pulmonary vessels etc [20. 23].</p>	<p>Drug-Drug Interactions can occur with CYP3A4 inhibitors. Drugs like cimetidine, diltiazem, fluconazole, protease inhibitor like HIV, hepatitis C etc. can increase Sirolimus blood concentration. Phenytoin, rifampin, carbamazepine, rifampin decreases Sirolimus blood concentration [23]</p>
Cyclosporine	<p>COVID-19 in-vitro studies show inhibition of the replication of the coronaviruses as cyclosporine shows antiviral activity against a variety of RNA viruses. It also shows activity</p>	<p>It can cause adverse reactions for liver, kidney and heart transplanted patients leading to renal dysfunction, tremor, hirsutism, hypertension etc. It can also lead to glomerular capillary thrombosis</p>	<p>Drug-drug interactions between Cyclosporine and herbal dietary supplement, St. John's Wort can cause rejection of transplanted organs, graft loss and reduction of</p>

	<p>against betacoronavirus [26-27].</p>	<p>with Cyclosporine and cause graft failure. Cyclosporine can also cause hypomagnesemia leading to convulsions etc [24, 28].</p>	<p>cyclosporine in blood concentration. NSAID drugs like naproxen and sulindac with Cyclosporine can decrease renal function [24, 28]</p>
Rituximab	<p>It can deplete lymphocytes leading to serious complications associated with COVID-19. It can also lead to patient's susceptibility to SARS nCoV-2 leading to complication of symptoms like respiratory failure [31 - 32]</p>	<p>It can cause adverse reactions leading to lymphoid malignancies along with lymphopenia, fever, infection, asthenia (physical weakness) etc. Also, it can cause muscle spasms, nausea, diarrhea, peripheral edema, anemia in patients suffering with Wegener's Granulomatosis disease [29, 33]</p>	<p>Drug-Drug interactions noted with cisplatin leading to fatal renal toxicity. It can also cause tumor lysis syndrome especially in patients suffering with non-hodgkin lymphoma. It can also cause rise in serum creatinine or lead to oliguria etc [29, 34].</p>