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The Deadly Combination of Pandemic and Diabetes Situation Is Very Bad and Without Hopes Which Turns the Road to Doom and Gloom



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ABSTRACT

Current research has revealed that If SARS-COV-2 enters diabetes patients, it could damage the pancreas, impairing its function, and the disease is much more severe and progresses quicker. The deadly combination of Covid and diabetes situation is very bad and without hope. Diabetes is a serious complication of coronavirus and is linked to several issues, including higher oxygen use, longer recovery times, and, to some extent, fatality. Nothing positive was on the Covid news, and every negative headline seemed full of doom and gloom. For many, however, a battle with COVID-19 has resulted in a whole new diagnosis of diabetes, known as COVID diabetes. COVID-19 has been linked to the onset of type 2 diabetes. With the recurrence of COVID-19 and the interruption of outpatient ward services in many medical facilities, normal diabetic care is projected to be impaired, leading to inadequate glycemic management, as seen during the lockdowns. In COVID-19, poor glycemic management was linked to severe illness and poor outcomes, as measured by an elevation in glycated hemoglobin (HbA1c). In COVID-19 patients with diabetes, inflammation and cytokine-mediated hyperglycemia are expected to be more prominent. In COVID-19 patients, hyperglycemia at arrival and during hospitalization is consistently linked to poor outcomes.



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INTRODUCTION

T1D is characterized by autoimmune destruction of insulin-producing pancreatic β -cells, while T2D results from a combination of β -cell secretory defect and insulin resistance (1).

The global burden of diabetes is high, with an overall prevalence of 9.3% and 463 million people suffering from the disease worldwide. (2)

It is often accompanied by various comorbidities and long-term complications, including obesity, hypertension, vasculopathy, a proinflammatory and hypercoagulable state, and cardiovascular disease. (CVD) (3,4)

Patients with diabetes are known to have an increased risk of infections, which is partly attributed to hyperglycemia causing immune dysfunction, among other effects. (5,6)

The identification of individualized therapies for diabetes in the future will require better characterization of the many paths to β -cell demise or dysfunction (7).

Across the globe, many groups are working on combining clinical, pathophysiological, and genetic characteristics to more precisely define the subsets of diabetes currently clustered into the type 1 diabetes versus type 2 diabetes nomenclatures to optimize treatment approaches. Many of these studies show great promise and may soon be incorporated into the diabetes classification system (8).

A growing body of evidence suggests that beyond the first 30 days, the acute phase of the disease, people with COVID-19 could experience post-acute sequelae—referred to as long COVID—which can involve pulmonary and extra pulmonary organ system manifestations, including diabetes outcomes. (9)

Although diabetes and other glycometabolic abnormalities have been widely reported during the acute phase of COVID-19, less is known about the risk and burden of diabetes and related outcomes in the post-acute phase of COVID-19. (10,11)

Type 2 Diabetes Mellitus (T2DM) is considered a risk factor for a poor prognosis in COVID-19 (12) related to the viral infection - increased release of cytokines and inflammatory mediators, which led to increased insulin resistance and the associated hyperglycemia (13).

Targeting ACE2 receptors located in pancreatic islets resulting in pancreatic injury may give rise to acute diabetes. (14)

Related to the use of proposed treatments to control infection- the use of glucocorticoids has been associated with a decreased mortality in critically ill patients infected with COVID-19. glucocorticoids have a remarkable impact on blood glucose(15).

COVID-19 predisposes infected individuals to hyperglycemia, leading to hyper glycosylation of ACE2 and increased viral proliferation (16) induces inflammation, endothelial dysfunction, and thrombosis via the generation of oxidative stress driving the dysregulation of glucose metabolism and hypercoagulability further. (17)

Chronic hyperglycemia and insulin resistance contribute to vasculopathy through various mechanisms like AGE-RAGE and oxidative damage. (18)

More prone to developing severe forms of the disease, and their inflammatory markers are higher compared to non-diabetics. (19)(20)

Hyperglycemia in covid 19, how and why?

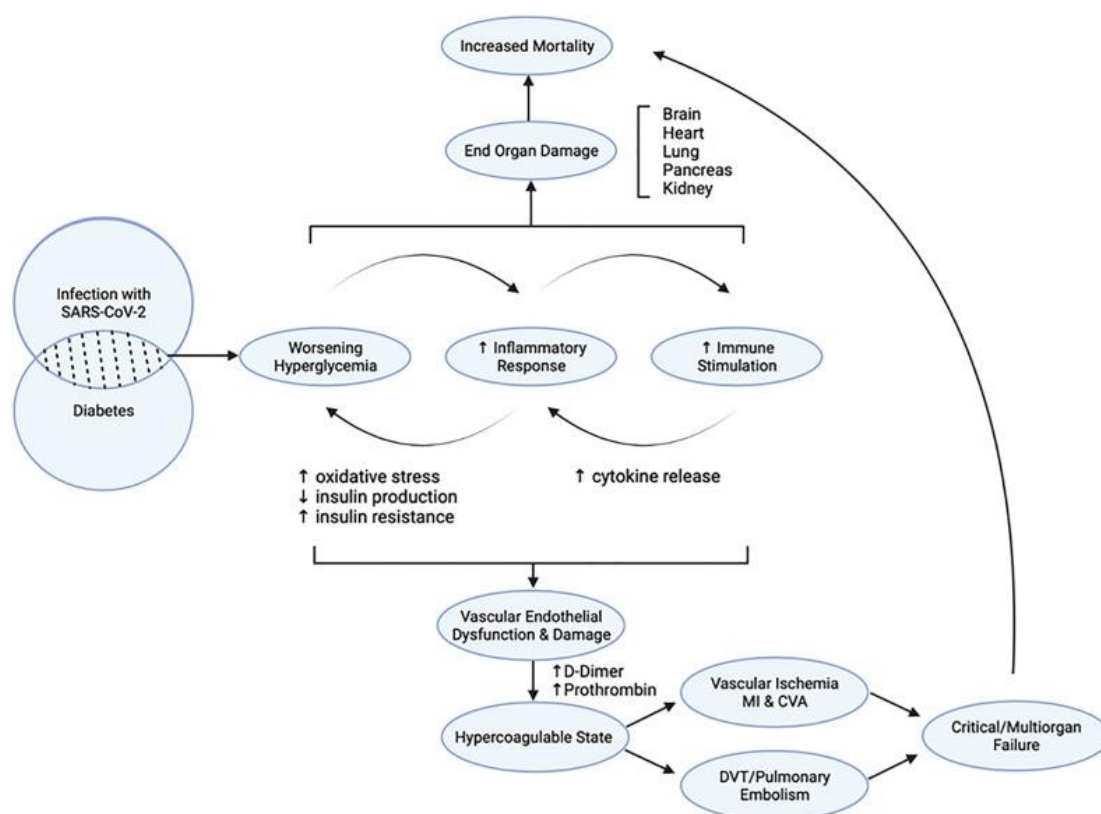
Steroids- can cause hyperglycemia, and steroid-induced diabetes (21), the higher the dose of steroid therapy, the higher the risk of developing steroid-induced diabetes. The use of steroids in diabetic patients increases the risk of hospitalization due to uncontrolled blood sugar. (22)

The prevalence of diabetes among COVID-19 patients admitted to intensive care units is two to threefold higher than that of non-diabetic individuals. Also, the mortality rate is twice that of non-diabetics. (23)

Complications of hyperglycemia in covid 19

DKA can occur in diabetic patients with COVID-19. Severe Acute Respiratory Syndrome Coronavirus-1 (SARS-CoV-1) was found to bind to the ACE2 receptor in the pancreatic islets, which causes cellular damage leading to acute onset of diabetes DKA. (24)

Diagram showing events in DIABETES and COVID 19



(25)

The looming of new diabetes—The deadly combination of Covid-19 and diabetes

The advent of new diabetes is progressively becoming a post-COVID consequence and a new danger to be afraid of, according to a recent article published in an endocrinology journal. There's a lot of research that shows how dangerous a fight with COVID-19 may be. Newer research has also revealed that perhaps the SARS-COV-2 virus could damage the pancreas, impairing its function, disrupting insulin metabolism and control, and ultimately causing diabetes.

The apparent similarities between COVID-19 and diabetes, which is also a vascular illness driven by inflammation, could be a serious risk factor for the virus attacking the respiratory system and pancreas, fuelling hyperglycemia as a post-infection consequence. Being the capital of the world in diabetes, India, has a history of early diagnosis, generally a decade ahead of worldwide standards. So, the incidence is increasing both in young and old patients with clinical signs of hyperglycemia, which is being exacerbated by the COVID-19 condition. While there's been an increase in COVID diabetes cases, people who have had

moderate or severe COVID diabetes and are on steroid therapy are more likely to develop Type-2 diabetes.

Diabetic patients with COVID-19 had a more severe presentation than non-DM patients.

Patients with a history of diabetes frequently experience severe hyperglycemia and diabetic ketoacidosis. For these lethal associations, various biological pathways have been proposed. First, DM is linked to lowered immunity. Chemotaxis, phagocytosis, and complement fixation are all affected by long- and short-term hyperglycemia. Second, DM can cause a pro-inflammatory state with elevated levels of cytokines such as interleukin-6 (IL-6) and tumour necrosis factor (TNF-), which has been linked to multi-organ failure in SARS-CoV-2 patients. Third, in patients with DM, the angiotensin-converting enzyme 2 (ACE2) receptor, which is the virus's entry route into human cells, is upregulated, allowing the virus to infect more cells. Finally, hyperglycemia raises glucose levels in airway secretions, making lung cells more susceptible to viral illness and multiplication.

Is the COVID-19 pandemic has shaken World's diabetic population?

In order to maintain glycemic control, they must be aggressive. An additional challenge for clinicians may be COVID-19-associated DM. Finally, the COVID-19 pandemic has posed a significant issue for developing countries, particularly for people with chronic conditions such as heart diseases, chronic respiratory diseases, essential hypertension and diabetes. These morbidities impose a significant socioeconomic impact on the country, particularly in pandemics like Covid. This pandemic has taught Indian diabetics the need of maintaining rigorous glycemic control and thereby avoiding short and long-term effects of diabetes, such as infections. During this epidemic, physicians must be extra cautious in reaching the intended glycemic control and increase patient awareness of illness understanding, care, and prevention of consequences.

Diabetics are on a Two-Fold Rise in the Several States

A recent survey conducted by the National Family Health Survey (NFHS-5) showed a doubled number of diabetic patients in the state of Gujarat between 2019 and 2021. As per the data, the rate of high and very high blood glucose levels was 14.8%.

Are diabetes patients more likely to get COVID-19?

Diabetes patients are liable to get serious complications. Diabetes associated with heart disease increases the risk of getting serious complications from COVID-19. Older people are also at higher risk of complications if they get the virus. Fatality increases as the number of people who die from the virus increases.

Do diabetes patients coincide with sober complications from COVID-19?

Diabetes patients are more likely to develop grave intricacies from COVID-19. Diabetes patients have critical manifestations and complications when infected with any virus, the risk from COVID-19 probably lower if your diabetes is well-controlled. Heart complications and other ailments in addition to diabetes could worsen the chance of getting seriously ill from COVID-19, like other viral infections. Viral infections increase inflammation in diabetes patients.

Are the risks dissimilar for type 1 and type 2 diabetes?

CDC is reporting at this time, people with type 1 or gestational diabetes might be at an increased risk for severe illness from COVID-19. Patients suffering from diabetes-related health problems are likely to have worse outcomes if they contract COVID-19 than people with diabetes who are otherwise healthy, whichever type of diabetes they have.

Case Report---1.

Name: N. Rajeev

Age: 62

Gender: male

Height: 182 cm

Weight: 88 kg

A 62 year old male patient presented with cough with expectoration and sore throat since 5 days, fever since 5 days and gradually developed shortness of breath since 3 days. On investigating he was found positive for covid 19 [Rt PCR]. He is not a known asthmatic, CAD but hypertensive and diabetic He is on TAB. LOSARTAN 50 mg OD after food.

TAB. VOGLIBOSE 0.2 MG + METFORMIN 500 BD BEFORE FOOD

He is an alcoholic and non-smoker and does not have the habit of using of tobacco.

Had a family history of hypertension, diabetes, asthma, CAD

On examination

SPO2: 85% @ RA

BP: 110/70 with LOSARTAN 50 MG

PR: 99 BPM

TEMPERATURE: 104 F

CVS: S1 S2 Heard, no added sounds

CNS: no focal neurological deficit

RS: normal vesicular breath sounds heard, Ronchi Is heard on lower lobe of left lung and on right side ronchi is heard over middle lobe of the right lung.

Fasting Blood sugars: 110 mg/dl

HBA1C: 6

CRP: 73

D DIMER: 800

Total leucocyte count: 17380

Platelets: 1.3 lakhs

CT CHEST: CORADS IV

CT SEVERITY SCORE 22/25

Vaccination status: covisheid two doses vaccinated

Patient was admitted and treated

Able to maintain 95% spo2 with O2 inhalation 18 lit/min HFNC

INJ. MONOCEF 1 GM IV BD FOR 5 DAYS

INJ.PANTOP 40 OD FOR 5 DAYS

INJ. REMDESIVIR 200 MG IV OD ON DAY 1



FOLLOWED BY 100 MG IV OD FROM DAY 2 TO DAY 5

INJ, METHYL PRED 60 MG FOR OD FOR 4 DAYS

FOLLOWED BY

TAB METHYL PRED 16 MG BD AFTER FOOD FOR 5 DAYS

FOLLOWED BY 8MG FOR 3 DAYS

TAB. DOLO 650 SOS

TAB BARICITINIB 4MG BD AFTER FOOD FOR 7 DAYS

TAB. ZINCOVIT OD AFTER FOOD FOR 2 WEEKS

TAB. ASCORBIC ACID 500 BD AFTER FOOD FOR 2 WEEKS

TAB. MONTAC LC OD AFTER FOOD FOR 5 DAYS

SYP. ASCORIL LS BD AFTER FOOD FOR 5 DAYS

TAB. APIXABAN 2.5 MG OD AFTER FOOD FOR 2 WEEKS

Patient was advised to have protein diet, plenty of fluids, adequate sleep and rest. adequate physical activity, mental peace, maintaining physical distancing from other family members ,strict isolation instructions during the recovery and monitor vitals such as spo2, temperature, pulse rate and if possible BP with home based BP manometer every day ,taking 6 minutes' walk test to assess the respiratory function status .Daily chart has to be maintained for quick reference of parameters. advise to the patient about self-observing of red flag signs such as age greater than 60, spo2 below 94%, chest pain, continuous worsening dry cough, shortness of breath, generalized weakness, continuous high grade fever not responding to medications, fluctuating pulse rate along with lab parameters if investigated such as lymphopenia, increased CRP, increased D DIMER, elevated LDH, thrombocytopenia, increased PCT, in case of aggravation of symptoms patient was advised for admission.

Patient got recovered well with medical management and got tested negative after 2 weeks of isolation period.

Post isolation instructions and instructions to end isolation such as sanitizing the room and articles used during the 2 weeks of illness, self-washing of used clothes and utensils and disinfecting the frequently touched and used surfaces.

Patient was asked to follow up checkup for every 30 days up to 6 months.

HBA1C after 1 month has risen to 7.7

Patient was advised to continue

TAB METFORMIN 500 + VOGLIBOSE 0.3 MG + GLIMIPRIDE 1MG BD AFTER FOOD

TAB ISTAMET 500/50 OD AFTER FOOD

TAB.ECOSPRIN 75 OD AFTER FOOD

TILL NEXT FOLLOW UP

Patient was advised to follow strict diabetes dietary control along with significant lifestyle measures such as physical activity and brisk walking were advised. A customized diet plan with all the necessary do's and don'ts and time based meal plan was given to the patient to follow. patient is asked to repeat FBS and PPBS every month and HBA1C every 3 months.

Case Report-2

Name: V. Sireesha

Age: 56

Gender: female

Height: 169 cm

Weight: 84 kg

A 56 year old female patient presented with cold since 5 days, fever since 4 days and gradually developed shortness of breath since 2 days. On investigating she was found positive for covid 19 [RT PCR]. She is a known diabetic, asthmatic.

She is on TAB METFORMIN 500 OD BEFORE FOOD

ROTAHALER FORACORT 2 PUFFS TID

she is not an alcoholic and nonsmoker, and does not have the habit of using of tobacco.

Had a family history of hypertension, diabetes

On examination

SPO2: 88% @ room air

BP: 140/80

PR: 77 BPM

TEMPERATURE: 104 F

CVS: S1 S2 Heard, no added sounds

CNS: no focal neurological deficit

RS: normal vesicular breath sounds heard, Ronchi Is heard diffusely heard all over both the lung

Fasting Blood sugars: 90 mg/dl

HBA1C: 5.9

CRP: 72

D DIMER: 550

Total leucocyte count: 15650

Platelets: 2.5 lakhs

CT CHEST: CORADS IV

CT SEVERITY SCORE 22/25

Vaccination status: coxing two doses vaccinated

Patient was admitted and treated

Able to maintain 98% spo2 with O2 inhalation 18 lit/min on HFNC

INJ. MAGNEX FORTE 1.5 GM IV FOR 5 DAYS

INJ.PANTOP 40 OD FOR 5 DAYS

INJ. REMDESIVIR 200 MG IV OD ON DAY 1

FOLLOWED BY 100 MG IV OD FROM DAY 2 TO DAY 5

INJ, METHYL PRED 125 MG FOR OD FOR 4 DAYS

FOLLOWED BY

INJ METHYL PRED 60 MG OD AFTER FOOD FOR 5 DAYS



FOLLOWED BY

TAB METHYL PRED 16 MG BD AFTER FOOD FOR 5 DAYS

FOLLOWED BY 8MG FOR 3 DAYS

TAB. DOLO 650 SOS

TAB. ZINCOVIT OD AFTER FOOD FOR 2 WEEKS

TAB. ASCORBIC ACID 500 BD AFTER FOOD FOR 2 WEEKS

TAB. MONTAC LC OD AFTER FOOD FOR 5 DAYS

SYP. ASCORIL LS BD AFTER FOOD FOR 5 DAYS

TAB. APIXABAN 2.5 MG OD AFTER FOOD FOR 2 WEEKS

Patient was advised to have protein diet, plenty of fluids, adequate sleep and rest. adequate physical activity, mental peace, maintaining physical distancing from other family members ,strict isolation instructions during the recovery and monitoring vitals such as spo2, temperature, pulse rate and if possible BP with home based BP manometer every day ,taking 6 minutes' walk test to assess the respiratory function status. Daily chart has to be maintained for quick reference of parameters. advise to the patient about self-observing of red flag signs such as age greater than 60,spo2 below 94%,chest pain, continuous worsening dry cough, shortness of breath ,generalized weakness, continuous high grade fever not responding to medications, fluctuating pulse rate along with lab parameters if investigated such as lymphopenia, increased CRP, increased D DIMER ,elevated LDH, thrombocytopenia, increased PCT, in case of aggravation of symptoms patient was advised for admission.

Patient got recovered well with medical management and got tested negative after 2 weeks of isolation period post isolation instructions and instructions to end isolation such as sanitizing the room and articles used during the 2 weeks of illness, self-washing of used clothes and utensils and disinfecting the frequently touched and used surfaces.

Patient was asked to follow up check-up for every 30 days up to 6 months.

HBA1C after 1 month has risen to 9.

Patient was advised to continue

TAB METFORMIN 500 TID BEFORE FOOD

SITAGLIPTIN 50MG OD AFTER FOOD

TAB.ECOSPRIN 75 OD AFTER FOOD

TILL NEXT FOLLOW UP

Patient was advised to follow strict diabetes dietary control along with significant lifestyle measures such as physical activity and brisk walking were advised. A customized diet plan with all the necessary do's and don'ts and time-based meal plan was given to the patient to follow patient is asked to repeat FBS and PPBS every month and Hba1C every 3 months.

Case Report—3

Name: K. Radha

Age: 46

Gender: female

Height: 156 cm

Weight: 69 kg

A 46 year old female patient presented with cough with expectoration and sore throat since 5 days, fever since 3 days and gradually developed shortness of breath since 2 days. On investigating she was found positive for covid 19 [RT PCR]. She is not a known diabetic, asthmatic, CAD but hypertensive and she is on TAB. TELMISARTAN 40 mg OD after food regularly.

She is not an alcoholic and nonsmoker, and does not have the habit of using of tobacco.

Had a family history of hypertension, diabetes, asthma

On examination

SPO2: 93%

BP: 120/70 with TELMISARTAN 40 MG

PR: 79 BPM

TEMPERATURE: 102 F

CVS: S1 S2 Heard, no added sounds

CNS: no focal neurological deficit

RS: normal vesicular breath sounds heard, Ronchi Is heard on lower lobe of right lung and on left side ronchi is heard all over the lung.

Random Blood sugars: 144 mg/dl

HBA1C: 6.4

CRP: 58

D DIMER: 680

Total leucocyte count: 18000

Platelets: 2.3 lakhs

CT CHEST: CORADS IV

CT SEVERITY SCORE 17/25

Vaccination status: covisheid two doses vaccinated

Patient was admitted and treated

Able to maintain 98% spo2 with O2 inhalation 5 lit/min

INJ. MAGNEX FORTE 1.5 GM IV FOR 5 DAYS

INJ.PANTOP 40 OD FOR 5 DAYS

INJ. REMDESIVIR 200 MG IV OD ON DAY 1

FOLLOWED BY 100 MG IV OD FROM DAY 2 TO DAY 5

INJ, METHYL PRED 60 MG FOR OD FOR 4 DAYS

FOLLOWED BY

TAB METHYL PRED 16 MG BD AFTER FOOD FOR 5 DAYS

FOLLOWED BY 8MG FOR 3 DAYS

TAB. DOLO 650 SOS

TAB. ZINCOVIT OD AFTER FOOD FOR 2 WEEKS

TAB. ASCORBIC ACID 500 BD AFTER FOOD FOR 2 WEEKS

TAB. MONTAC LC OD AFTER FOOD FOR 5 DAYS

SYP. ASCORIL LS BD AFTER FOOD FOR 5 DAYS

TAB. APIXABAN 2.5 MG OD AFTER FOOD FOR 2 WEEKS

Patient was advised to have protein diet, plenty of fluids, adequate sleep and rest. adequate physical activity, mental peace, maintaining physical distancing from other family members ,strict isolation instructions during the recovery and monitor vitals such as spo2, temperature, pulse rate and if possible BP with home based BP manometer every day, taking 6 minutes' walk test to assess the respiratory function status .Daily chart has to be maintained for quick reference of parameters. advise to the patient about self-observing of red flag signs such as age greater than 60,spo2 below 94%,chest pain, continuous worsening dry cough, shortness of breath , generalized weakness, continuous high grade fever not responding to medications, fluctuating pulse rate along with lab parameters if investigated such as lymphopenia, increased CRP, increased D DIMER ,elevated LDH, thrombocytopenia, increased PCT, in case of aggravation of symptoms patient was advised for admission.

Patient got recovered well with medical management and got tested negative after 2 weeks of isolation period.

post isolation instructions and instructions to end isolation such as sanitizing the room and articles used during the 2 weeks of illness, self-washing of used clothes and utensils and disinfecting the frequently touched and used surfaces.

Patient was asked to follow up checkup for every 30 days upto 6 months.

HBA1C after 1 month has risen to 8.3

Patient was advised to continue

TAB METFORMIN 500 TID BEFORE FOOD

TAB.ECOSPRIN 75 OD AFTER FOOD

TILL NEXT FOLLOW UP

Patient was advised to follow strict diabetes dietary control along with significant lifestyle measures such as physical activity and brisk walking were advised. A customized diet plan with all the necessary do's and don'ts and time based meal plan was given to the patient to follow. patient is asked to repeat FBS and PPBS every month and HBA1C every 3 months.

Treating hyperglycemia/type 2 diabetes in covid 19

Insulin therapy is preferred for hospitalized patients, including moderate to severe COVID-19 disease.

Better health outcomes have been reported in COVID-19 patients receiving Metformin. (26)

It is hypothesized that Metformin may inhibit virus entry into cells through adenosine monophosphate (AMP)-activated protein kinase activation and the B–mammalian target of rapamycin (m TOR) signalling pathway. (27)

DPP-4 may act as a receptor for some coronaviruses, and hence, DPP-4 inhibitors might inhibit such binding and mitigate COVID-19 infection. (28)

Pioglitazone inhibits the secretion of proinflammatory cytokines, and so it may mitigate the cytokine storm. (29)

SGLT2-inhibitors may have a potent antiviral effect by increasing lactate concentration and simultaneously decreasing the intracellular pH, thereby potentially lowering the viral load. (30)

Canagliflozin therapy, an SGLT2-inhibitor, could induce a reduction in interleukin-6 (IL-6) levels, which plays an essential role in triggering the cytokine release syndrome (CRS) in COVID-19 patients.

For non-critical hospitalized patients, a basal plus bolus correction regimen is recommended with a target blood sugar range of 117–180 mg/dl.

Covid-19 treatment

Remdesivir

Remdesivir is an adenosine, nucleoside analogue which competes with natural nucleosides during replication for the RNA-dependent RNA polymerase (RdRp) active site, thus inhibiting the viral replication.

Favipiravir

It acts by inhibiting RdRp needed for viral transcription in host cells.

Corticosteroids

Steroids use have been proposed to suppress the inflammatory cytokine storm suggested the beneficial impact of corticosteroid use in critically ill COVID-19 patients (requiring oxygen supplementation). Corticosteroids can act by multiple pathways including the inhibition of formation of cytokines and reducing clearance of macrophages and natural killer cells.

Monoclonal Antibodies

Monoclonal antibodies (mAbs) alter the immune system response.

Tocilizumab (TCZ)

It is IgG1 recombinant monoclonal antibody used for the treatment of cytokine release syndrome (CRS). It inhibits the inflammatory action of IL-6 by inhibiting the IL-6 receptor and was postulated to have some role in patients with a severe or life-threatening COVID-19 disease.

CONCLUSION

Several studies have suggested that adults face an increased risk of diabetes diagnosis after contracting COVID-19. Youth younger than 18 years old with COVID-19 were shown to be at higher risk of developing diabetes more than 30 days after their COVID-19 infection. Oxygen therapy, corticosteroids and anticoagulation are the therapy in COVID-19. Counseling of patients with mild diseases plays a major role in management. Remdesivir and Tocilizumab should be used cautiously.

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