Diabetes in COVID-19: Management

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Abstract

The COVID-19 (Corona Virus Disease-19) has become the most critical health problem worldwide. It was first started from Wuhan, China and now it has affected more than 230 countries and millions of people. The diabetic patients with uncontrolled glycemic state for long term can result in many microvascular and macrovascular complications. Hence they are most commonly affected individuals during COVID-19. In this review we have briefed about the impact of COVID-19 in diabetes, the different pathophysiology and management of diabetes in this phase.

Key Words: COVID-19, Diabetes

Background

The Corona Virus Disease-19 (COVID-19) has changed the scenario all over the world. It ranges from affecting the children to geriatrics with several effects on economy, psychology, education and obviously the health of people.

It has started since December 2019 from Wuhan, China and progressed further involving more than 200 countries including India. [1][2][3] The COVID-19 is fatal pandemic spread throughout the world. The corona virus is positive single stranded RNA, which is named so because of its similarity to the shape and structure of a crown or solar corona as per appearance in electron microscope. [1][3]

The WHO (World Health Organization) proclaimed the COVID-19 flare-up as international emergency crisis on 30th January, 2020 and moved up to Pandemic on eleventh March, 2020.[3][4]

It has caused many deaths and severe illnesses in many patients who have poor immunity. The vulnerable population regarding morbidity and mortality includes patients with presence of comorbid conditions. Diabetes is well known to affect the majority of population worldwide leading to comorbid condition. [1][5][6][7]

So we have written a brief review on the effect of COVID-19 on Management of Type 2 Diabetes patients.

Ethical Approval

This study did not warrant institutional review board review as no human subjects were involved.

Symptoms and Characteristics Of COVID-19

The symptoms of Corona Virus Infectious Disease-19 include fever, sneezing, coughing, body ache and difficulty in breathing. The incubation period varies from 2 to 14 days and the symptomatic phase from 6 to 41 days. Some of the patients may develop respiratory distress due to viral pneumonia and ultimately respiratory
failure. The number of hospitalizations is much more than common virus infection leading to severe respiratory distress and deaths. However, not all the patients progress towards respiratory distress and death, many people remain asymptomatic or with mild symptoms in spite of being corona positive. This is more dangerous as we cannot know where to identify and how to prevent the further spread.[1]

The Diabetes and COVID-19

Various studies conducted in china have shown that majority of the patients who were admitted due to COVID-19 were having comorbid conditions compared to patients with no comorbidity. The rate of death was higher in patients with comorbid state due to development of pneumonia.[9][14][15][16]

The diabetic individuals are with poor immunity due to increased blood sugar level, which acts as a factor contributing to invite COVID-19 infection easily. Among diabetic patients, exaggerated cytokine response leads to pro inflammatory response resulting in expanded degree of Interlekin-6 (IL-6) and C-responsive protein (CRP). The corona virus infection provokes inflammation and prompts a cytokine storm. This inflammatory process weakens the immunity of diabetic people putting them in vulnerable population group for COVID-19 infection.[14][18][19]

Angiotensin Converting Enzyme 2 (ACE 2) receptors are present in pancreas, cell membrane of lung, enterocytes and many other tissues. ACE2 is involved in prevention of inflammation and has anti oxidant property. This enzyme degrades the angiotension II and I to smaller peptides, and these peptides play role as anti inflammatory and anti oxidants.[14][20][21]

ACE 2 receptors can increase the blood sugar level even in patients who are not diabetic but when infected with COVID-19. This hyperglycemia may be due to damage to beta cells in pancreas. It was observed that patients infected with SARS were hyperglycaemic for 3 years even after recovered which establishes the injury to pancreatic beta cells.[18][22] The study reported in Wuhan shows that the diabetic patients admitted for COVID-19 were unable to control the hyperglycemia inspite of management according to guidelines American Association of Clinical Endocrinologists and American Diabetes Associations. These all points add on the vulnerability of diabetic patients to catch on the COVID-19 infections and worsening of the morbidity state leading to mortality.[14]

Management of Hyperglycaemia in Diabetes with Presence of COVID-19

The diabetic patients who have uncontrolled blood sugar level for long term can cause many complications.[20] A study reported that diabetes was the most impacted condition due to COVID-19 followed by chronic obstructive pulmonary disease (COPD), hypertension, heart disease, asthma, cancer and depression. So the diabetes leads among all the diseases to be affected specifically in presence of corona virus.[23]

The COVID-19 deregulates the glycemic control in diabetic patients worsening the comorbid state of patient. A study reported in Wuhan that more than 50% of the blood glucose measurements were abnormal in admitted diabetic patients for COVID-19. Hence, it suggests the meticulous management of diabetic patients as hyperglycemia plays important role in organ damage in diabetes.[24]

The type 2 diabetic patients have been most commonly managed by Metformin, and if it cannot be controlled with Metformin alone then additionally Insulin administration is required. The diabetics are at higher risk of hospital admission after catching corona virus infection. Therefore they need to be managed by Insulin administration for hyperglycemia when not controlled with oral antidiabetics.[5][6][7][14]

The Metformin is first line drug to be prescribed to type 2 Diabetic individuals. The Metformin can significantly decrease the risk of mortality in patients with chronic respiratory infection. A study reported there was significant decrease in death rate in diabetic patients with Metforin compared to diabetic without Metformin.[18]

It activates the AMP-activated protein kinase (AMPK) in the liver, which causes functional changes to ACE 2 receptor. Thus, it may diminish the attachment of SARS-CoV-2. So Metformin seems to be helpful to diabetics during COVID-19.[14]
The other antidiabetic drugs which are commonly used include GLP-1 analogue (Glucagon-Like-Peptide-1 analogue), SGLT-2 (Sodium Glucose Transporter-2) blockers and DPP4 (Dipeptidyl Peptidase 4) inhibitors. Besides the antidiabetic effect, they play role as anti-inflammatory, anti adipogenic and antagonism of Insulin Resistance. However, SGLT2 inhibitors and GLP1 analogue increase the expression of ACE2 receptors, so they can worsen the state of patient in presence of COVID-19. So it seems to withhold the SGLT 2 inhibitors in patients at this phase when COVID is widely spread.\[14\]

DPP4 inhibitors can increase the chances of upper respiratory infection but not the pneumonia. However, enough clinical evidences are needed to establish the role of DPP4 inhibitors in diabetic patients with COVID-19. The preclinical data has revealed that DPP4 inhibitors can reduce the severity of COVID-19 but again the sufficient clinical evidence is must to ascertain the relationship.\[14\][18]

A study reported that Thiazolidinediones put the diabetic patient at higher risk of pneumonia in comparison of patients on sulfonylureas. A study had reported that Pioglitazone increase the expression of ACE 2 receptors and so it may worsen the metabolic state in presence of COVID-19.\[14\][18]

**Conclusion**

The COVID-19 has become the serious health problem with world wide spread. The vulnerable population to be affected with it and leading to morbidity and mortality includes patients with poor immunity and comorbid conditions. The diabetic individuals are most commonly impacted with COVID-19 and so their strict control of hyperglycemia is mandatory to prevent the further worsening of state. Metformin has been the first choice of drugs to be prescribed in Type 2 diabetes. It has additional anti inflammatory property and it significantly reduces the morbidity as well as mortality in type 2 diabetic patients in comparison of other antidiabetic agents during this phase.

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**References**


