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Covid-19 and diabetes: A review

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Abstract
COVID-19 has emerged as one of the greatest challenges for humankind after the Second World War. Identification of effective preventive and treatment strategies is urgently needed. People with diabetes and related co-morbidities are at increased risk of its complications and of COVID-19-related death. Older age, multi-morbidity, hyperglycaemia, cardiac injury and severe inflammatory response are predictors of poor outcome. The complex interplay between COVID-19, diabetes and the effects of related therapies is being explored. Most patients experience a mild illness with COVID-19, while people with diabetes are at increased risk of severe disease.[3] Present review of literature aims to collate currently available data about diabetes and COVID-19 infection.

Keywords: COVID-19. diabetes mellitus, SARS CoV- 2

Introduction

Corona virus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) virus and has become a pandemic within a few months after it was first described in Hubei province in China [1]. COVID-19 is highly transmissible from person to person through respiratory secretions. The virus enters through mucous membranes of the upper respiratory tract; later affecting lungs [2]. The corona virus disease 2019 (COVID-19) has emerged as one of the greatest challenges faced by humankind in the recent past. People with diabetes and related co-morbidities are at increased risk of its complications and of COVID-19-related death. Older age, multi-morbidity, hyperglycaemia, cardiac injury and severe inflammatory response are predictors of poor outcome. The complex interplay between COVID-19, diabetes and the effects of related therapies is being explored. Most patients experience a mild illness with COVID-19, while people with diabetes are at increased risk of severe disease [3]. This review of literature aims to collate currently available data about diabetes and COVID-19 infection.

Diabetes and Susceptibility to infections [4]

Both type 1 and type 2 diabetes increases the susceptibility to infections and their complications. The main pathogenic mechanisms are: hyperglycemic environment increasing the virulence of some pathogens; lower production of interleukins in response to infection; reduced chemotaxis and phagocytic activity, immobilization of polymorphonuclear leukocytes; glycosuria, gastrointestinal and urinary dysmotility. Some infections almost always affect only diabetic persons, such as malignant external otitis, rhinocerebral mucormycosis, and gangrenous cholecystitis. In addition to being potentially more serious, infectious diseases in DM may result in metabolic complications such as hypoglycemia, ketoacidosis, and coma. The recommendation of compulsory immunization with anti-pneumococcal and influenza vaccines is essential because of their impact on the reduction of respiratory infections, the number and length of hospitalizations and the number of deaths related to respiratory tract diseases.

Mechanism that Increases the Risk of COVID-19 in Diabetes [5, 6]

Augmented ACE2 expression in alveolar AT2 cells, myocardium, kidney, and pancreas may favour increased cellular binding of SARS-CoV-2. Plasma glucose levels and DM are independent predictors for mortality and morbidity in patients with SARS. Potential mechanisms that may increase the susceptibility for COVID-19 in patients with DM include:

1. Higher affinity cellular binding and efficient virus entry
2. Decreased viral clearance
3. Diminished T cell function
4. Increased susceptibility to hyper inflammation and cytokine storm syndrome
5. Presence of CVD.

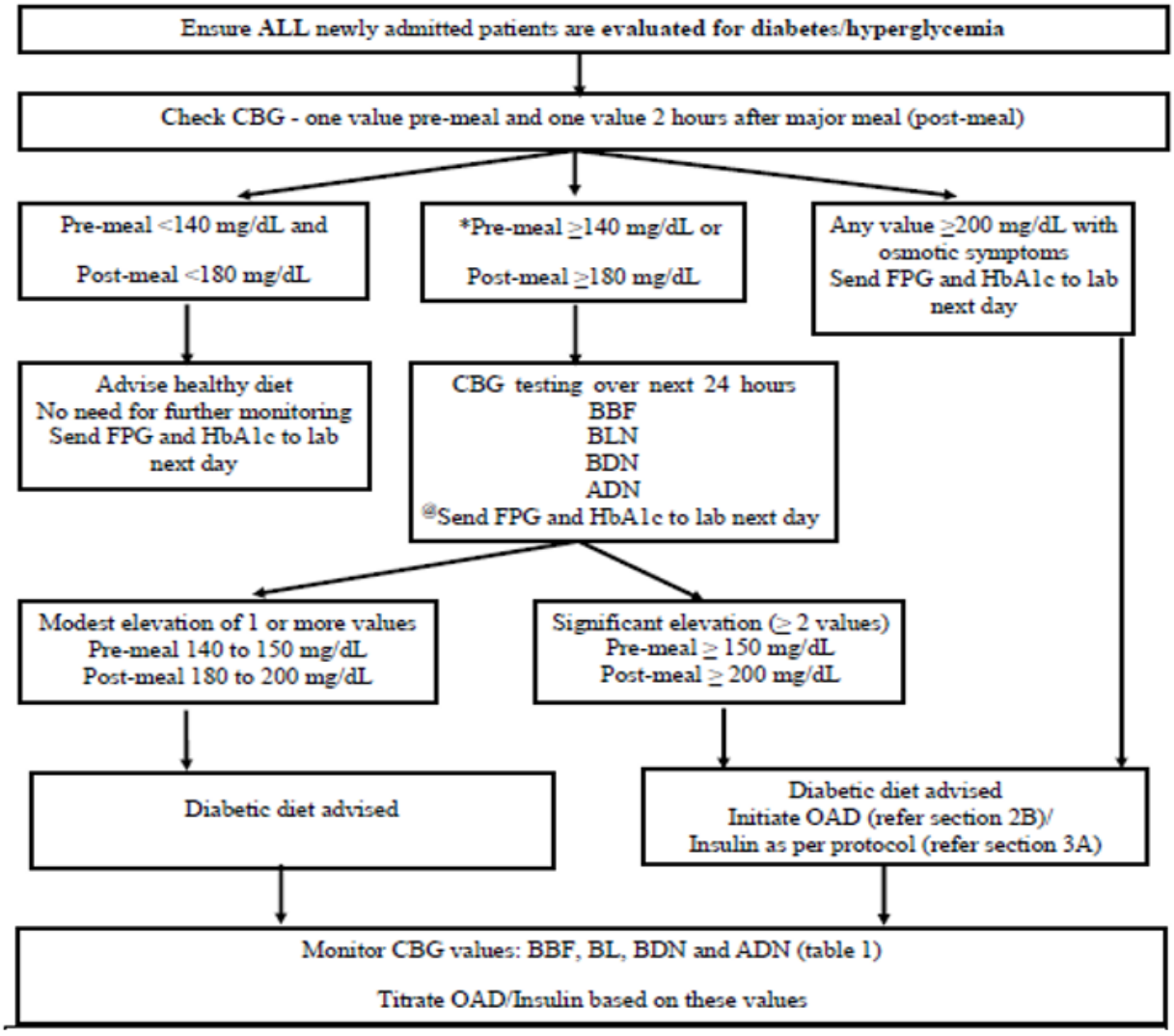
DM inhibits neutrophil chemotaxis activity, phagocytosis, and intracellular killing of microbes. Impairments in adaptive immunity characterized by an initial delay in the activation of Th1 cell-mediated immunity and a late hyper inflammatory

response are often observed in patients with diabetes. In patients with COVID-19, peripheral counts of CD4 and CD8 T cells are low, but with a higher proportion of highly pro inflammatory Th17 CD4 T cells, as well as elevated cytokine levels. Thus, it is likely that patients with DM may have blunted antiviral IFN responses, and the delayed activation of Th1/Th17 may contribute to accentuated inflammatory responses. Another potential mechanism was that hyperglycemia was a risk factor for mortality. Hyperglycemia induced by diabetes was linked to aggressive glycosylation, which leads to overproduction of advanced glycation end products.

Care for diabetic patient during Covid-19 [7]

1. Patients with diabetes need to maintain regularity in daily diet. Care should be taken not to vary the calorie intake markedly. Healthy balanced diet with good amount of protein, fiber and limitation of saturated fats is important to maintain a good glycemic control.
2. Exercise should be continued. Home based exercise like cycling, treadmill, stationary jogging and resistance exercise with small weights are beneficial.
3. Regular intake of antidiabetic drugs and insulin is important and should be emphasized.
4. Telemedicine can be very helpful in these times. Patients can consult their physician via telemedicine and appropriate advice about treatment can be given.
5. Care of feet should be emphasized in order to avoid foot related complications. There are telemedicine temperature mats which can screen for inflammation without having to visit the clinic.
6. The patients who show inflammation can then be called to the clinic.
7. Patients need to be educated about the need to visit the hospital urgently in emergency situations like vomiting, drowsiness, shortness of breath, chest pain, weakness of limbs, altered sensorium etc.

Table 1: Screening of hyperglycemia in every patient hospitalized with COVID-19[8]



Abbreviations: ADN: After dinner; BBF: Before breakfast, BDN: Before dinner, BBL: Before lunch, CBG: Capillary blood glucose; FPG: Fasting plasma glucose, HbA1c: Hemoglobin A1c; OAD: Oral antihyperglycemic drug

Management of diabetic patient with Covid-19 infection

Patients with diabetes developing symptoms suggestive of COVID-19 infection should immediately notify local healthcare services to determine the need for diagnostic evaluation, assessment of severity, isolation and hospitalisation. Because there is a higher risk of adverse outcomes, patients with diabetes should be preferentially managed in hospitals or settings where close monitoring of disease progression is possible. For those managed at home, regular tele contact with healthcare services and follow-up is crucial to recognise deterioration in glycaemic control, development of hyperglycaemic emergencies or deterioration of clinical health status. Frequent glucose monitoring, healthy diet, adequate hydration and dose titration of glucose-lowering medication in cooperation with healthcare providers should be prioritised. Patient may take symptomatic therapy, including paracetamol/acetaminophen, which is the preferred anti-pyretic agent [9].

A patient-centered approach should be used to guide the choice of pharmacological agents. Considerations include age, severity of COVID-19, cardiovascular co-morbidities, and hypoglycemia risk. For patients with mild COVID-19, previous medication regimens should be evaluated and followed as appropriate. For ordinary cases, subcutaneous insulin injections, including rapid-acting prandial/ basal insulin or premixed insulin regimens, are recommended. For severe and critically ill patients, intravenous insulin therapy may be the preferred treatment [10, 11].

Table 2: Management of patients with diabetes and COVID [3, 12]

<table>
<tr><td colspan="3">Prevent infection in people with diabetes
“Five No” (no going out, no gatherings, no sedentariness, no stop on medications, and no anxiety).
“Five Keep” (keep wearing a face mask when you go out, keep hands clean, keep routine medical check if necessary, keep regular life, and keep scientific attitude to COVID-19).
“Five Refuse” (refuse to visit friends, refuse group dining, refuse to taste wild animals, refuse rumors, and refuse to shake hands or hug or kiss) should be advocated for patients with diabetes by endocrinologists, health-care providers, and public health administrators.</td></tr>
<tr><td colspan="3">Glycaemic control</td></tr>
<tr><td>Asymptomatic infection
ere
illness
▪ Home/hospital care
▪ Continue usual therapy</td><td>Symptomatic non-severe illness
▪ Hospital care
▪ Usual therapy with caution
▪ ± Insulin</td><td>Severe illness
▪ ICU care
▪ MDI of insulin
▪ IVI insulin for critically ill</td></tr>
</table>

Abbreviations

IVI, intravenous infusion; MDI, multiple daily injections.

Conclusion

COVID-19 has emerged as one of the greatest challenges for humankind after the Second World War. Identification of effective preventive and treatment strategies is urgently needed. It is important to follow standard hospital management and treatment regimens for COVID-19-affected patients with diabetes. It is recommend to follow “Seven Treasures” policy for diabetes management, including health education, balanced nutrition, physical activity, standardized medication, blood glucose monitoring, regular schedule, and care for mental health.

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