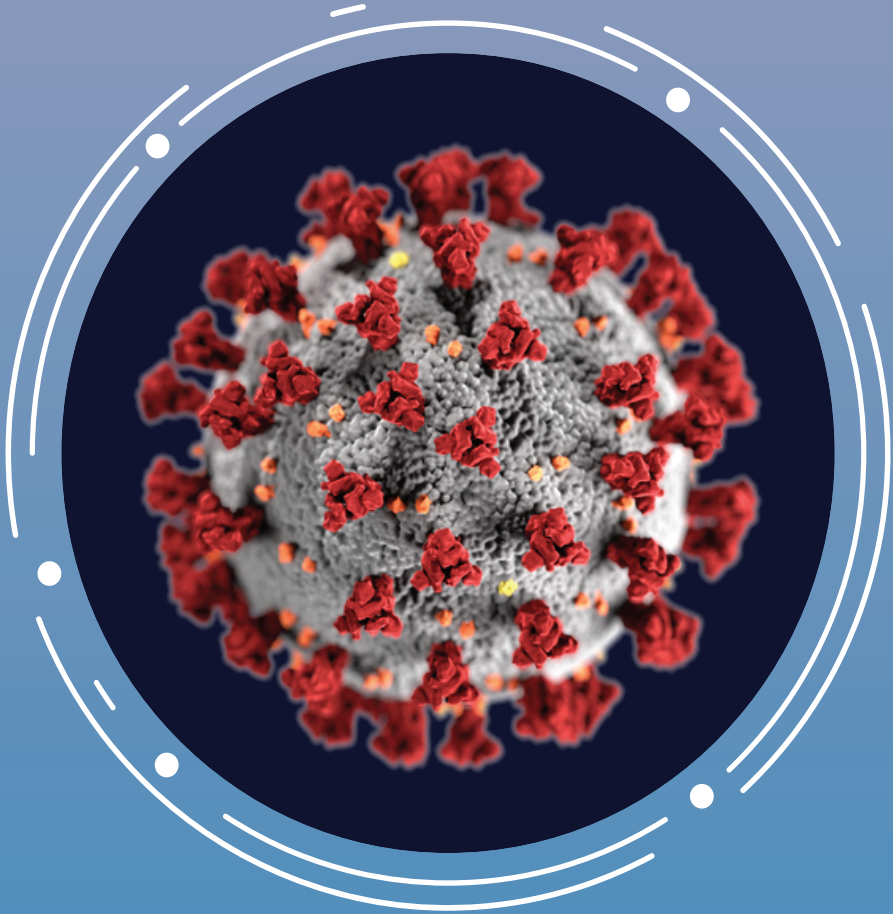# COVID 19 & Diabetes

BADAS Guide for Healthcare Professionals

A joint initiative of Diabetic Association of Bangladesh & NCDC Program, Directorate General of Health Services

Message

President (Elect)
International Diabetes Federation

I am delighted to know that BADAS is publishing the first BADAS Guide on COVID-19 and Diabetes for Healthcare Professionals. I like to take this moment to express my heartfelt gratitude to all members who worked relentlessly to develop the guide. COVID-19 outbreak, which started in December 2019 in Wuhan, China, has turned into a global pandemic. Every day, the world is witnessing an increasing number of infected cases and related deaths. Pieces of evidence from around the world are showing that people with comorbid conditions, including diabetes, are at higher risk for the severity and death from corona virus. According to the IDF 2019 report, 8.4 million people have had diabetes, and the same number of people are at risk for diabetes in Bangladesh. Therefore, it is crucial to devise a national guidance to secure uniform strategies for prevention and clinical management. Like all the countries, Bangladesh has started the preparation to control and contain the pandemic. The BADAS guidance is based on the latest evidence available COVID-19 and Diabetes.

I look forward to witnessing the broad utilization of this guide.

Professor Akhtar Hussain
NORD University, Norway

Message

President

Diabetic Association of Bangladesh

It gives me immense pleasure to know that BADAS is publishing the first BADAS Guide on COVID-19 and Diabetes for Healthcare Professionals. I express my heartfelt thanks to all the members of the editorial team and advisory committee for putting their effort to develop the guide.

The world is suffering from a pandemic of CORONA-19, and diabetes is reported as significant contributors of morbidity and mortality. These two pandemics represents with different characteristics in term of healthcare burden mainly because of different presentation (acute vs chronic) and transmission (communicable vs non-communicable), but which may be closer than previously thought. Scientific evidences have shown that people with diabetes are more vulnerable to the severe effects of the coronavirus. This infection is rising faster in Bangladesh, which is already suffering from the huge burden of diabetes. It is important for people living with diabetes to take precautions to avoid the virus if possible and needs to get access to evidence-based practice in healthcare. It is well known that to ensure the quality care competence building of a physician is an utmost need. I believe this initiative will help the physicians to guide their patients appropriately. In this regard, I like to thank the NCDC program, Directorate General of Health Services, for their support in developing this guide.

This guide is a living document. Committee members will update the guide from time to time to incorporate the latest evidence.

I look forward to the success of this guide.

Professor AK Azad Khan

Message

Secretary General

Diabetic Association of Bangladesh

COVID-19 is running on an epidemic scale almost all over the world; Bangladesh is no exception. Day by day, the number of new cases are increasing, and different types of comorbid conditions, including diabetes, are more prone to be affected by this heavily contagious viral infection.

I am happy to know that BADAS is going to launch the first BADAS Guide on COVID-19 and Diabetes for Healthcare Professionals for the prevention and management of diabetes based on the current evidence during the COVID-19 outbreak. We are also privileged to have the NCDC program, Directorate General of Health Services, for their collaboration.

I sincerely hope this guideline will be helpful to physicians and will serve a useful purpose in handling this crisis.

Md Sayef Uddin

Message

Directorate General

Directorate General of Health Services

The coronavirus disease (COVID-19) is running on an epidemic scale almost all over the world. Bangladesh is no exception. Day by day, the number of infected patients and related deaths are increasing. COVID-19 infection is a double challenge for people with diabetes. Diabetes has been reported to be a risk factor for the severity of the disease. Routine care of diabetes has already been significantly disrupted during the current pandemic. Stress levels and disruptions to diet and physical activity may also contribute to worsening outcomes during and following the pandemic.

I am happy to see the joint initiative of the BADAS and Non-communicable Disease Control (NCDC) program and appreciate their effort to develop this guide. This guide is directly aligning with the objective of the NCDC program of the Govt.

I sincerely hope this guide will be helpful for healthcare professionals and will serve a useful purpose in routine practice.

Professor Dr. Abul Kalam Azad

Background

COVID-19 is an infectious disease caused by the most recently discovered coronavirus (currently named SARS-CoV-2). This new virus and infection were unknown before the outbreak began in Wuhan, China, in December 2019. This virus was found in both animals and humans. In humans, it is known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [1-3]. The World Health Organization (WHO) declared the outbreak of COVID-19, a Public Health Emergency of International Concern on 30 January 2020 [4], and on 11 March 2020, announced a Pandemic [5]. A total of 2,623,415 confirmed cases, and 183,027 confirmed deaths were documented in 210 countries, areas, or territories till April 22, 2020. A total of 3,772 confirmed cases, and 120 confirmed deaths were documented in Bangladesh till April 22, 2020 [6].

Diabetes mellitus (DM) has already become a worldwide epidemic. On 20 December 2006, the UN General Assembly passed a resolution (61/225) and declared 14 November as World Diabetes Day [7]. This landmark resolution recognizes DM as a chronic, debilitating, and costly disease associated with significant complications that poses severe risks to families, countries, and the entire world. The International Diabetes Federation (IDF) has predicted that the number of individuals with DM would increase from 463 million (with a prevalence of 9.3%) in 2019 to 700 million (10.9%) in 2045, with 80% of the disease burden restricted in low- and middle-income (LMIC) countries [8].

DM is already known to worsen outcomes of other similar viral infections such as SARS-CoV or the H1N1 virus [9]. This interaction is alarming, considering the high transmission rate of SARS-CoV-2 and the global prevalence of DM. Overall proportion of DM in COVID-19 is about 5.3% to 20% and mortality rate is about 2.3 to 15% [9]. Less number of people with DM experience clinical symptoms like fever, chill, chest tightness and shortness of breath. This phenomenon, which resembles the silent symptoms people with DM experience also in other conditions such as myocardial infarction, may cause a life-threatening delay in providing the needed care, finally resulting in poorer prognosis. Therefore, we need to rapidly halt COVID-19 spreading and be prepared for the worst-case scenarios by knowing much more about the factors predisposing people with diabetes to COVID-19 progression.

Epidemiology

- In December 2019, a new strain of coronavirus, officially named severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), was first isolated from three patients with coronavirus disease 2019 (COVID-19) by the Chinese Center for Disease Control and Prevention [10].

- As of April 22, 2020, COVID-19 has been confirmed in over two and a sixty million individuals worldwide and has resulted in more than 183,027 deaths [6]. A total of 210 countries and territories have reported laboratory-confirmed cases of COVID-19.

- In the United States, as of March 16, 2020, patients aged >65 years had accounted for 31% of all reported COVID-19 cases, 45% of hospitalizations, 53% of admissions to the ICU, and 80% of fatalities attributable to the infection. Among patients admitted to the ICU as of March 16, 2020, 7% were adults aged >85 years, 46% were aged 65-84 years, 36% were aged 45-64 years, and 12% were aged 20-44 years [11].

- Of the 149,082 laboratory-confirmed COVID-19 cases between February 12 and April 2, 2020, 2,572 cases (1.7%) involved children (<18 years) [12].

- New data show that African Americans are more vulnerable to COVID-19.

- According to the CCDC delivered on March 10, 2020, COVID-19 was reported to be most severe in older adults [13]. At presentation, approximately 40% of the cases were 'mild' with no pneumonia symptoms. Another 40% were 'moderate' with symptoms of viral pneumonia, 15% were 'severe,' and 5% 'critical.' While the illness, 10%-12% of cases that initially presented as the mild or moderate illness progressed to severe, and 15%-20% of severe cases eventually became critical.

- Zeng et al. presented data on 33 neonates born to mothers with COVID-19 [14]. They reported good outcomes except for three newborns with COVID-19, all of whom presented with early-onset pneumonia but eventually recovered.

- People with diabetes mellitus are at increased risk for COVID-19 infection. Studies had found a high rate of diabetes (5.3 to 20%) among hospital admitted patients with confirmed COVID-19 [9].

Pathophysiology of COVID-19 in people with DM [9]

Potential mechanisms that may increase the susceptibility for COVID-19 in people with DM include:

- Higher affinity cellular binding and efficient virus entry
- Decreased viral clearance
- Diminished T cell function
- Increased susceptibility to hyperinflammation and cytokine storm syndrome

Modes of transmission [15, 16]

- COVID-19 can survive from a few hours up to a few days, depending on the environmental conditions.
- The virus appears to spread most easily through close contact with an infected person.
- The disease can spread from person to person through small droplets from the nose or mouth, which are spread when a person with COVID-19 coughs or exhales.
- People can also catch COVID-19 if they breathe in droplets from a person with COVID-19 who coughs out or exhales droplets.
- It is essential to stay more than 2 meters (6 feet) away from a person who is sick.
- Transmission of the virus can also occur by indirect contact with surfaces in the immediate environment or with objects used on the infected person (e.g., stethoscope or thermometer).
- There is a possibility of airborne transmission.
- Shedding of virus varies according to severity of clinical presentation; most patients with milder symptoms spread the virus for shorter period (10 days) than those with more severe symptoms.

Presentation

- Symptoms may develop 2 days to 2 weeks following exposure to the virus [17]. The mean incubation period is 5.1 days, and 97.5% of individuals who developed symptoms did so within 11.5 days of infection [18].
- Presentations of COVID-19 have ranged from asymptomatic/mild symptoms to severe illness and mortality. Common symptoms have included fever, cough, and shortness of breath [17]. Other symptoms, such as malaise and respiratory distress, have also been described [19].

- 1 in 4 infected people may be an asymptomatic carrier.
- The most common clinic finding was fever (98%), followed by cough (76%) and myalgia/fatigue (44%). Headache, sputum production, and diarrhea were less common. The clinical course was characterized by the development of dyspnea in 55% of patients and lymphopenia in 66%. Acute respiratory distress syndrome (ARDS) developed in 29% of patients [20], and ground-glass opacities are common on CT scans [21].
- Chinese Center for Disease Control and Prevention (CCDC) reported that 81% cases were mild (absent or mild pneumonia), 14% were severe (hypoxia, dyspnea, >50% lung involvement within 24-48 hours), 5% were critical (shock, respiratory failure, multiorgan dysfunction), and 2.3% were fatal [22].
- Initially, many diabetic patients remain asymptomatic or present with milder symptoms [9].

Differences between Common Cold, Influenza and COVID-19 Flu

	Common Cold	Influenza	COVID-19 Flu
Incubation period	1-3 days	1-4 days	2-14 days
Symptom onset	Gradual	Abrupt	Gradual
Symptoms last	7-12 days	3-7 days	Mild cases: approximately 2 weeks Severe or critical disease: 3-6 weeks
Fever	Sometimes	Common	Common
Runny nose	Common to less common	Sometimes	Less Common
Sore throat	Common	Sometimes	Less Common
Cough	Common	Sometimes	Common
Body ache	Rare, if occurs mild	Common	Less Common
Difficulty in breathing	Rare	Rare	More common

Risk factors for severe COVID-19

These include (but are not limited to) the following [13, 23, 24]

- Advanced age
- Male gender
- Immunocompromised state
- Diabetes
- Cardiovascular disease
- Hypertension
- Chronic pulmonary disease
- Chronic renal disease
- Liver disease
- Malignancy
- Morbid obesity (BMI ≥40 kg/m^2)

Complications

Reported complications of COVID-19 have included pneumonia, acute respiratory distress syndrome (ARDS), cardiac injury, arrhythmia, septic shock, liver dysfunction, acute kidney injury and multi-organ failure. People with diabetes do face an increased risk of DKA (diabetic ketoacidosis) and or hypoglycemia. DKA is commonly experienced by people with type 1 diabetes [15].

Diagnosis

1. **Diagnostic criteria based on clinical signs and symptoms** [25]

Suspect case
a. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND a history of travel to or residence in a Country/location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset.

OR

b. A patient/ health care worker with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset.

OR

c. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Laboratory testing should be done in all the suspected cases.

Probable case:

a. A suspect case for whom testing for the COVID-19 virus is inconclusive. Inconclusive being the result of the test reported by the laboratory.

OR

b. A suspect case for whom testing could not be performed for any reason.

Confirmed case:

a. A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.

2. **Laboratory findings**

- The test is a real-time reverse transcription-polymerase chain reaction (rRT-PCR) assay that can be used to diagnose the virus in respiratory and serum samples from clinical specimens [26].

- At a minimum, respiratory material should be collected – upper respiratory specimens (nasopharyngeal and oropharyngeal swab or wash), and/or lower respiratory specimens (sputum and/or endotracheal aspirate or bronchoalveolar lavage).

- Additional clinical specimens may be collected as the COVID-19 virus has been detected in blood and stool. In the case of patients who are deceased, consider autopsy material, including lung tissue [27].

- The FDA has approved a qualitative immunoglobulin M (IgM)/immunoglobulin G (IgG) antibody test for SARS-CoV-2 using the serum, plasma (EDTA or citrate), or venipuncture whole blood. IgM antibodies generally become detectable several days after initial infection, while IgG antibodies can be detected later [28].

- Normal or low TC of WBC, lymphopenia, high CRP, low Procalcitonin. if these are associated with bilateral pneumonia in Chest x-ray (finding more in peripheral lower zone of chest) or ground glass opacity in CT scan of Chest are diagnostic of COVID 19 in this current time [25].

- CBC, LDH, ferritin, D- dimer, ALT, creatinine, blood sugar – daily investigations. High D-dimer levels are associated with poor prognosis in COVID-19 infected patients.

Prognosis

- Early reports have described COVID-19 as clinically milder than MERS or SARS in terms of severity and case fatality rate. [24] So far, the fatality rate for COVID-19 appears to be around 2% [29].
- Attributable deaths in the USA have been most common in adults aged >85 years (10%-27%), followed by adults aged 65-84 years (3%-11%), adults aged 55-64 years (1%-3%), and adults aged 20-54 years (<1%) [30].
- Early in the outbreak, the WHO reported that severe cases in China had mostly been reported in adults older than 40 years of age with significant comorbidities and with male preponderance [29].
- In China, the case-fatality rate was found to range from 5.8% in Wuhan to 0.7% in the rest of China. In most cases, a fatality occurs in patients who are older or who have underlying health conditions (e.g., diabetes, cardiovascular disease, chronic pulmonary disease, cancer, hypertension) [20].

Prevention

Prevention at health care level

Health care workers are playing a critical role in the COVID-19 outbreak response. According to World Health Organization (WHO), responding to COVID-19 requires serious preparation and response, which includes equipping healthcare workers and healthcare facility management with the information, procedures, and tools required to safely and effectively work.

Protecting hospital/clinics dealing with people with DM

- Have a triage station at the entrance, prior to any waiting area, to screen patients for COVID-19. This limits potential infection throughout the Hospitals and Clinics.
- Prepare a well-defined and separate waiting area for suspected cases.
- Have alcohol-based hand rub or soap and water handwashing stations readily available for the use of healthcare workers, patients, and visitors.
- Be alert for anyone that may have symptoms such as cough, fever, shortness of breath, and difficulty breathing.

- Give the suspect patient a triple layer surgical mask.
- Limit the movement of patients within the health center to reduce potential infection throughout the healthcare facility.
- If a patient needs to be moved, plan the move ahead: all staff and visitors who come into direct contact with the patient should wear personal protective equipment.
- Limit the number of visitors per patient.
- All visitors should wear the required personal protective equipment, and their visits should be recorded.
- Perform regular environmental cleaning and disinfection.
- Maintain good ventilation –if possible open doors and windows.

Protecting healthcare workers dealing with people with diabetes

1. Train all the health workers on the importance, selection, and proper use of personal protective equipment.
2. Train to spot symptoms of potential COVID-19 infection and offer a triple layer surgical mask to suspected cases.
3. Know the case definition and have a decision flow diagram available and accessible for reference at the triage station.
4. Isolate a suspected case promptly.
5. Place patients in single rooms, or group together those with the same etiological diagnosis.
6. Use a triple layer surgical mask if working within 2 meters of the patient.
7. If possible, use either disposable or dedicated equipment (e.g., stethoscopes, blood pressure cuffs, and thermometers). If equipment needs to be shared among patients, clean and disinfect between each patient use.
8. Perform hand hygiene frequently. Use alcohol-based hand rub or wash hands with soap and water:
    - Before touching a patient
    - After touching patient surroundings
    - Before engaging in clean/aseptic procedures
    - After body fluid exposure risk
9. Before addressing any patient, put on:
    - surgical mask that covers the mouth and nose
    - disposable gloves

- a clean, long-sleeve gown
- eye protection such as goggles

10. Do not touch eyes, nose or mouth with gloves or bare hands until proper hand hygiene has been performed

11. If any health professionals start coughing, sneezing or develop a fever after providing care, report your illness immediately to the concerned authority like Government designated hospitals or IEDCR (Institute of Epidemiology, Disease Control and Research) or DGHS (Directorate General of Health Services) or see a nearby designated hospital immediately and follow their advice. For any query call to **16263 or 333 [6].**

Prevention at personal level (people with DM)

1. Wash hands with soap and water regularly, for at least 20 seconds, especially before eating or drinking and after using the bathroom and blowing your nose, coughing, or sneezing, and after being in public.

2. If soap and water are not readily available, use an alcohol-based sanitizer with at least 60% alcohol.

3. Cover nose and mouth when coughing or sneezing with a tissue or a flexed elbow, then throw the tissue in the closed bin.

4. Avoid touching eyes, mouth, or nose when possible.

5. Use triple layer surgical mask.

6. Disinfect frequently touched household objects (like a door handle, switch).

7. Maintain distance from sick individuals and who are in isolation.

8. Do not share food, tools, glasses, and towels.

9. Avoid public gathering.

10. Avoid unprotected contact with wildlife and farm animals.

11. If someone present with symptoms such as fever, cough, shortness of breath, especially if he/she believe he/she may have been exposed to COVID-19 patient or live in or have recently traveled to an area with the ongoing spread of disease, call nearby Government designated hospitals or IEDCR or DGHS or see a nearby designated hospital immediately. For any query call to 16263 or 333 [6].

12. Explain any symptoms, recent travel, or possible exposure to COVID-19. Your health care professional will work with the appropriate authority to determine if you need to be tested for COVID-19.

13. Maintain contact with your physician for any query.

14. Diabetic Patients registered through BADAS Centers and BADAS Affiliated Associations can call **10614**, Ibrahim Healthline, to obtain primary medical advice.

Advice for people with DM

1. Gather the contact information from your doctor and hospital.
2. For people with diabetes register in different centers/ hospital of BADAS and its affiliated centers, keep their diabetes guidebook on-hand.
3. Preserve your last prescription for consultation with diabetologist.
4. Have enough regular medications for two-four weeks in case you cannot get to the pharmacy to refill your prescriptions.
5. Ensure you have enough device supplies (i.e. vials, pens, syringes, strips, needles, etc.)
6. Ensure all your medications have refills available, so you do not have to leave the house if you become ill.
7. Have extra supplies like rubbing alcohol, hand sanitizers, and soap to wash your hands.
8. Keep simple sugars (e.g., glucose tablets, hard candies, juice) on-hand in case you need to treat low blood glucose, which may occur more frequently with illness.
9. Have ketone strips available (if you have type 1 diabetes).
10. Review sick days management protocol.

Management

General management

If anyone present with symptoms such as fever, cough, shortness of breath, and may have been exposed to COVID-19 patient or live in or have recently traveled to an area with the ongoing spread of disease, he needs to contact the nearby designated hospital immediately.

General guidelines to manage diabetes during an illness should be followed. If a person with diabetes becomes diseased with COVID-19. The following steps should be followed

1. Take diabetes medication as usual and should never be stopped without physician's consultation.
2. Frequent self-monitoring of blood glucose should be continued.
3. Drink extra (sugar-free) fluid and try to eat as normal.
4. Measure body weight every day. Losing weight while eating normally is a sign of hyperglycemia
5. Check body temperature at least twice daily or more frequently if there is a fever. A fever may be a sign of infection.

6. During fever, plenty of fluids intake: 120 to 180 ml every half an hour is required to prevent dehydration.

7. Followings are symptomatic treatment for Influenza like illness [25]
   - Tab Paracetamol 500 mg 1+1+1
   - Tab Antihistamine (Fexofenadine 120/180 mg) 0+0+1
   - Steam inhalation/Gurgle of Lukewarm water

Diet plan for people with DM during COVID-19 outbreak

1. A previously planned diabetic diet plan is enough for the management of diabetes.
2. During COVID 19 outbreak foods as fresh fruits, vegetables, foods containing vitamin C, nuts may help to boost up the immunity and can help to combat infection.

Exercise plan for people with DM during COVID-19 outbreak

1. Avoid exercise if symptoms of infection.
2. In situations like the COVID-19 pandemic, there is a restriction in the outdoor movement, and indoor exercise facilities as gyms, sports centers, and swimming pools remain closed.
3. Daily physical activity is an integral part of diabetes management, helping to maintain blood glucose at recommended levels.
4. The following are few activities that can be practiced indoor during isolation and social distancing during COVID 19 outbreak.

- Bodyweight exercises such as push-ups, squats, deep stationary lunges, sit-ups, or crunches (to strengthen the abdomen) and forward flexes (to strengthen the lower-back muscles).
- Joint mobility and stretching exercises that can be sourced from a common workout, yoga can be done as routines.
- Jump rope (if physical and medical conditions permit)
- If available at home
  - Treadmill: one-hour brisk walking (no need to run) or stationary bicycle: two 15-minute sessions at variable intensity can be used.
  - During home exercise, it should be remembered to avoid overload and adapt exercise intensity to individual ability and fitness level.

Medication

1. The only approved treatment as of today is **Social Distancing, Quarantine** and in affected cases symptomatic treatment only.

2. Following medications are indicated only for pulmonary syndrome without hypoxia [28]

   - Chloroquine: 500 mg BID for 7 days

   - Hydroxychloroquine: 400 mg BID -Day 1 and then 200 mg –TID from Day 2 to Day 10

   Efficacy and safety of Chloroquine and Hydroxychloroquine (HCQ) for treatment of COVID-19 remain unclear [15, 25].

   Due to hypoglycemic effect of Chloroquine and Hydroxychloroquine, a dose adjustment of OADs/insulin might be needed. Frequent monitoring of blood glucose should be advised [15, 25].

   HCQ is contraindicated in persons with retinopathy and pregnant women [31]. Therefore, this drug cannot be recommended in a diabetic people with retinopathy, gestational diabetes (GDM), and diabetic pregnancy.

3. Various antiviral drugs are being used, like lopinavir/ ritonavir combination [32], remdesivir, favipiravir etc. without any definite conclusion yet.

Chemoprophylaxis

As per the recommendation of the Indian Council of Medical Research-ICMR (as released on March 23, 2020), the advisory provides placing the following high-risk population under chemoprophylaxis with hydroxychloroquine [33]:

a) Asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19

b) Asymptomatic household contacts of laboratory confirmed cases

Indian Heart Rhythm Society strongly discourages the use of hydroxychloroquine for the general public without medical supervision and prescription [31]. They have noticed hydroxychloroquine induced cardiac arrhythmia, which may lead to sudden death. Caution should be more for diabetic people having a chance of a silent cardiac event.

Vaccination

Coronavirus vaccine are in early trials. We have to wait for the future results.

Sick days management for people with DM [34, 35]

It is important to practice sick day management. some common rules are:

1. Drink lots of fluids to maintain hydration.
2. If there is vomiting, then take small sips of water every 15 minutes or so throughout the day to avoid dehydration and eat small frequent meals.
3. Avoid physical activity.
4. Follow the advice of your diabetologist regarding medication usage.
5. Do self-monitoring of blood glucose (SMBG) as follows:

Type of diabetes	Blood sugar level	Blood glucose monitoring
Type 1	>10 to 14 mmol/l	every 2-4 hours
Type 1	>14 mmol/l with Ketonuria	every 2 hours
Type 2	>10 to 14 mmol/l	extra blood glucose testing will often be necessary
Type 2	>14 mmol/l: perform urine ketone and if ketone positive	every 2 hours

6. These principles are to be followed until the blood glucose is <10 mmol/L and ketone diminishes or disappears.
7. It may be necessary to take extra insulin to bring down higher blood glucose levels.
8. Be aware of symptoms of hypoglycemia or severe hyperglycemia.
9. If there is hypoglycemia 15 grams of simple carbohydrate like glucose, honey, jam, candy, juice to be taken and re-check your blood sugar in 15 minutes to make sure that blood glucose levels are rising. Repeat the cycle if low blood glucose is persisting.
10. Wash hands and clean injection/infusion and finger-stick sites with soap and water or rubbing alcohol.
11. The anti-diabetic agents should never be stopped altogether; dose may need to be reduced.
12. If the person is on insulin, intermediate or long acting insulin is continued; the dose may need to be reduced. Shorter acting insulin should be adjusted according to blood glucose values and food intake.
13. If the person is on OAD the dose is to be readjusted; sometimes the longer acting OADs may need to be replaced by shorter acting ones or insulin.

Special attention [34, 35]

Some of the following conditions require special attention and may necessitate hospitalization:

- Vomiting or diarrhea persists for longer than 6 hours
- Sick for 2 days and not getting better
- Blood glucose remains above 14 mmol/L
- Moderate ketonuria persists despite treatment
- Very young individual
- Abdominal pain
- Hyperventilation
- Co-existing serious diseases

Dietary plans in case of nausea/vomiting [36]

Blood glucose levels	Action
Over 14 mmol/	Drink sugar free, caffeine free liquids in place of meal. Avoid milk product and fruit juice
10 – 14 mmol/l	Drink/ eat 15 grams of carbohydrate in place of meal. Also, probably need additional liquid from water, soup, or calorie free caffeine source
Under 10 mmol/l	Try to drink or eat usual mealtime carbohydrate. If vomiting after insulin administration, may need to sip sugar-water every 20-30 minutes to maintain blood sugar of 5.5-10 mmol/l
Under 5.5 mmol/l and vomiting persists	May require hospitalization

Foods, which contain about 15 grams of carbohydrates each [36]

- 1 cup (125 ml) of fruit juice
- 1 cup of soup
- 2 cups (250 ml) of skimmed or low-fat milk
- 1 cup (125 ml) of regular soft drink
- 1 cup of ice cream or frozen yoghurt
- 1 cup of cereal (unsweetened)
- 6 crackers
- 1/3 cup of rice
- 1 cup of mashed potato

Treatment target and management of diabetes with COVID-19 [37, 38]

Stage	Clinical status	FBG (mmol/l)	2 hrs PP (mmol/l)	RBG (mmol/l)	Treatment
Mild disease	Influenza like illness	4.4-6.1	6.1-7.8		As ongoing**
Moderate illness	Pneumonia	6.1-7.8	7.8-10.0		S/C insulin
Severe illness/Critical	Severe pneumonia, Sepsis, ARDS, Septic shock	---	----	7.8-10.0	I/V Insulin infusion

Ensure: Blood glucose monitoring, dynamic evaluation and timely adjustment of strategies should be strengthened to ensure patient safety and promote early recovery of patients. **for SGLT2i -** careful observation is required regarding the development of hypovolemia, electrolytes imbalance and ketosis.

Abbreviation: FBG, fasting blood glucose; 2hPP, 2 hours post prandial; RBG, random blood glucose; SGLT2i, Sodium-glucose cotransporter 2 inhibitors; ARDS, acute respiratory distress syndrome; S/C, subcutaneous; I/V, intravenous.

Follow up plan after hospital discharge

- Self-isolation till becoming virus-negative which may take a few days to several weeks
- Maintain good glycemic control

These are the cornerstone in the management after hospital discharge.

Hyperglycemia and pregnancy [38]

- For hyperglycemia and pregnancy (GDM and diabetic pregnancy), maintain all COVID-19 norms.
- Routine antenatal follow-up can be done by consulting respective gynecologist and diabetes management to diabetologist.
- During delivery time, consult with a respective gynecologist and report to the designated hospital.
- Affected women with GDM/ diabetic pregnancy may take a tab—Azithromycin 500 mg daily for seven days.
- Hydroxychloroquine is pregnancy category D safety level and not approved by the US Food and Drug Administration (FDA).

Reasons of glucose fluctuation in people with DM and COVID-19 [40-42]

People with DM may develop hypoglycemic or acute hyperglycemic complications due to following reasons:

1. Irregular diet, reduced exercise, gastrointestinal (GIT) symptoms, etc., affect diet resulting in glucose fluctuation.
2. Stress conditions like infection increase glucocorticoids secretion.
3. The use of glucocorticoids in treatment can lead to a sharp rise in glucose.
4. There may be interruption or non-standard treatment with oral agents in isolation wards, resulting in glucose fluctuation.
5. Fear, anxiety, and tension may increase glucose level and induce glucose fluctuation.
6. COVID-19 can cause human body to produce a large number of inflammatory cytokines and lead to extreme stress in some severe and critical patients.

If these develop, should be treated urgently following standard protocols.

Hypertension and COVID-19 [25, 43-47]

1. People with raised blood pressure may face an increased risk for severe complications if they are infected with the COVID-19 virus.
2. There are no conclusive clinical data in humans to show that ACE-Inhibitors or ARBs either improve or worsen susceptibility to COVID-19 infection, nor do they affect the outcomes of those infected.
3. In the absence of any such data the International Society of Hypertension (ISH), European Society of Cardiology (ESC), European Society of Hypertension (ESH) and U.S. Heart Groups strongly recommend that the routine use of ACE-Inhibitors or ARBs to treat raised blood pressure should continue and should not be influenced by concerns about COVID-19 infection.
4. Limit or avoid nonsteroidal anti-inflammatory drugs (NSAID) and decongestants, especially if blood pressure is uncontrolled.
5. People taking medication for mental health, corticosteroids, oral birth control pills, immunosuppressants, and some cancer medications should monitor blood pressure to make sure it is under control.

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