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Cardiometabolic vigilance in COVID-19 and resource husbandry in resource-challenged times: Clinical practice- based expert opinion



Ashok Kumar Das ^{a,*}, Sanjay Kalra ^b, Krishnakumar B ^c, Kamal Sharma ^d, Mathew John ^e, Tiny Nair ^f, Shehla Shaikh ^g, Deepak Khandelwal ^h, Gagan Priya ⁱ, Deep Dutta ^j, Prathosh Gangadhar ^k, Atul Dhingra ^l, Mangesh Tiwaskar ^m, Rishi Shukla ⁿ, Sambit Das ^o, Manash Pratim Baruah ^p, Kalyan Kumar Gangopadhyay ^q, Santosh Ramakrishnan ^r, Vaishali Deshmukh ^s, Arundhati Dasgupta ^t, GVijaya Kumar ^u, Neelam Pandey ^v, Amya Joshi ^w, Vineet Kumar Surana ^x, Hitesh Punyani ^y, Parag Shah ^z, Aditya Rattan ^{aa}, Sruti Chandrasekaran ^{ab}, Arthur Asirvatham ^{ac}

^a Department of Endocrinology & Medicine, Pondicherry Institute of Medical Sciences, Puducherry, India

^b Department of Endocrinology, Bharti Hospital, Karnal, Haryana, India

^c Department of Cardiology, Government Medical College, Thiruvananthapuram, Kerala, India

^d Department of Cardiology, U.N.Mehta Institute of Cardiology, B.J. Medical College, Civil Hospital, Ahmedabad, India

^e Department of Endocrinology, Providence Endocrine & Diabetes Specialty Centre, Thiruvananthapuram, India

^f Department of Cardiology, PRS Hospital, Trivandrum, Kerala, India

^g Department of Endocrinology & Diabetes, Prince Aly Khan Hospital, Mumbai, India

^h Department of Endocrinology, Dr. Khandelwal's Diabetes & Endocrinology Clinic, New Delhi, India

ⁱ Department of Endocrinology, Fortis Hospital, Chandigarh, Punjab, India

^j Department of Endocrinology, Center for Endocrinology Diabetes Arthritis & Rheumatology (CEDAR) Superspecialty Clinic, New Delhi, India

^k Department of Endocrinology, IQRAA Hospital, Calicut, Kerala, India

^l Department of Endocrinology, Gangaram Bansal Hospital, Rajasthan, India

^m Department of Medicine, Shilpa Medical Research Centre, Mumbai, Maharashtra, India

ⁿ Department of Endocrinology, Regency Hospital, Kanpur, India

^o Department of Endocrinology, Apollo Hospitals in Bhubaneswar, India

^p Department of Endocrinology, Excelcare Hospital, Guwahati, India

^q Department of Endocrinology, Fortis Hospital, Kolkata, India

^r Department of Endocrinology, Magna Centers for Obesity, Diabetes and Endocrinology, Hyderabad, India

^s Department of Endocrinology, Deshmukh Clinic and Research Centre, Pune, Maharashtra, India

^t Department of Endocrinology, Rudraksh Superspecialty Care, Siliguri, India

^u Department of Diabetology, Apollo Hospitals, Chennai, Tamil Nadu, India

^v Department of Endocrinology, Max Hospital, Gurgaon, India

^w Department of Endocrinology & Diabetes, Bhaktivedanta Hospital and Research Institute, Mumbai, Maharashtra, India

^x Department of Endocrinology, Manipal Hospitals, New Delhi, India

^y Department of Medicine, Chaitanya Cardio Diabetes Centre, New Delhi, India

^z Department of Endocrinology and Diabetes, Gujarat Endocrine Centre, Ahmedabad, India

^{aa} Department of Cardiology, Heart Line Hospital, Panchkula, Hararyana, India

^{ab} Department of Endocrinology and Diabetes, Dr Rela Institute of Medical Science (RIMC), Chennai, Tamil Nadu, India

^{ac} Department of Diabetology, Arthur Asirvatham Hospital, Madurai, Tamil Nadu, India

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ABSTRACT

Background and aims: The ongoing pandemic of coronavirus disease 2019 (COVID-19) is rapidly evolving, thereby posing a profound challenge to the global healthcare system. Cardiometabolic disorders are associated with poor clinical outcomes in persons with COVID-19. Healthcare challenges during the COVID-19 pandemic are linked to resource constraints including shortage of Personal Protective Equipment's (PPE), laboratory tests and medication. In this context, a group of clinical experts discussed the endocrine and cardiology vigilance required in times of COVID-19. Further, the group proposed

* Corresponding author.

E-mail address: ashokdas82@gmail.com (A.K. Das).

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certain resource husbandry recommendations to be followed during the pandemic to overcome the constraints.

Method: The clinical experts discussed and provided their inputs virtually. The expert panel included clinical experts comprising endocrinologists, Consultant Physicians and cardiologists from India. The panel thoroughly reviewed existing literature on the subject and proposed expert opinion.

Results: The expert panel put forward clinical practice-based opinion for the management of cardiometabolic conditions including diabetes mellitus and hypertension. As these conditions are associated with poor clinical outcomes, the expert panel recommends that these persons be extra-cautious and take necessary precautions during the ongoing pandemic. Further, experts also provided appropriate, affordable, available and accessible solution to the resource constraint situations in times of COVID-19 pandemic.

Conclusion: The clinical expert opinion put forward in this article will serve as a reference for clinicians treating diabetes and cardiovascular disease during the COVID-19 pandemic.

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1. Introduction

The sudden emergence of coronavirus disease 2019 (COVID-19) poses an unprecedented challenge to the global healthcare system. COVID-19 is a viral respiratory disease caused by the 2019 novel coronavirus (2019-nCoV), first reported in Wuhan city of China in December 2019 [1,2]. The highly contagious nature of the disease—along with its high infecting capability even during the asymptomatic phase—has resulted in rapid disease transmission, leading to a global pandemic [3]. According to the latest World Health Organization (WHO) report, as on 19 August 2020, the number of confirmed cases was 21,989,366 while 775,893 deaths have been reported worldwide [4].

The clinical manifestations of COVID-19 are heterogeneous and include flu-like symptoms (fever, dry cough, rhinorrhea), gastrointestinal symptoms (diarrhea and nausea/emesis), and severe respiratory symptoms (dyspnea, acute respiratory distress syndrome, or fulminant pneumonia) [3,5]. COVID-19 is caused by the novel Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Following activation of the viral spike protein, the virus binds itself to the human angiotensin-converting enzyme 2 (ACE2) receptors which is usually expressed in the lungs, heart, intestinal epithelium, vascular endothelium, and kidneys [6,7].

Because of the rapid spread and high mortality rate associated with COVID-19, it is important to assess risk factors for the condition. According to current evidence, hyperglycemia and underlying cardiovascular diseases are poor prognostic factors associated with increased risk of hospitalization, Acute Respiratory Distress Syndrome (ARDS), need for ventilatory support, cardiac & renal injury and increased fatality of COVID-19 disease [3,8]. An initial study by Huang et al. conducted in the Wuhan cluster reported that 32% of affected persons had underlying comorbidities—including diabetes, hypertension, and cardiovascular disease [9]. Further, Singh et al., who studied the clinical characteristics of hospitalized persons with COVID-19 in China reported high prevalence of hypertension, diabetes and cardiovascular disease in patients with COVID-19. Further, they also noted that the persons with underlying comorbidities required longer intensive care unit (ICU) admission compared to persons without comorbidities [10]. Evidence from studies has demonstrated that diabetes is a risk factor for the progression and prognosis of COVID-19. Patients with COVID-19 and underlying cardiovascular and metabolic comorbidities have a greater inflammatory response, hyper-coagulant state and greater tissue damage resulting in poor clinical outcomes [11]. Further, the rapid spread of the pandemic has led to the lockdown of countries, including the shutting down of other medical services

(including regular check-ups and monitoring). Persons with underlying comorbidities must maintain optimal glycemic and vasculo-metabolic health [11,12]. Hence, there is a need to frame certain practice guidelines to monitor the cardiometabolic status of persons with underlying comorbidities, especially during the COVID-19 pandemic. In this context, a group of Indian experts aimed to propose clinical practice and experience based expert opinions for monitoring and managing cardiometabolic disorders during the COVID-19 pandemic.

2. Methodology

The experts reviewed available literature evidence and provided individual insights, based on experience, for the management of patients with COVID-19 having underlying comorbidities (diabetes and cardiovascular disease). The expert panel comprising of endocrinologists, cardiologists, diabetologists and consultant physicians, infectious disease and critical care specialists discussed and provided their inputs virtually on June 15, 2020. Based on scientific evidence and collective clinical judgment from practice, the panel members discussed key points about COVID-19 infection and associated risk factors including the need for cardiometabolic protection during these unprecedented times.

2.1. Cardiometabolic dysmetabolism

Like previous viral epidemics, the presence of cardiometabolic comorbidities has been reported to be an independent risk factor for increased fatality in persons with COVID-19. According to a retrospective study by Zhou et al., 67% of deceased persons with COVID-19 had underlying comorbidities, with hypertension (48%), diabetes (31%), and cardiovascular disease (13%) being the most common comorbidities [13]. The results of several epidemiological studies and evidence from several centers have reported a fatality rate of 50% and higher in people with diabetes as compared to those without diabetes [14].

2.1.1. Cardiometabolic derangements

The pathogenesis of the cardiovascular complications in COVID-19 includes direct myocardial injury, systemic inflammation resulting from high circulatory levels of proinflammatory cytokines, altered myocardial demand–supply ratio (increased cardiometabolic demand), rupture of plaque with resultant coronary thrombosis, electrolyte imbalances, and as a result of adverse events from antiviral therapies [3]. Hyperglycemia is an important factor associated with poor outcomes in persons with COVID-19 [8]. Hyperglycemia increases the risk of severe disease and occurs in

severe disease. New onset hyperglycemia has also been frequently reported. The possible causes include stress hyperglycemia, counter-regulatory hormones, inflammatory markers, use of glucocorticoids, inotropes and dextrose-containing IV fluids, and a possible direct effect of SARS-CoV2 on pancreatic islets [15]. Hyperglycemia without diabetes and new-onset diabetes are both associated with poorer outcomes in COVID-19 [15]. Two specific mechanisms have been implicated in the association between COVID-19 and diabetes mellitus. It has been hypothesized that the SARS-CoV-2 virus attacks the endocrine pathway, which is involved in the regulation of blood pressure, insulin and glucose metabolism, and inflammation. Further, ACE2 receptors are involved in protective effects during inflammation. However, ACE2 receptors are binding sites for coronavirus spike protein, and hence there is reduced expression of ACE2 in COVID-19 persons. Decreased ACE-2 expression can lead to hyperinflammation, cellular damage, and respiratory failure. The expression of ACE2 on pancreatic β -cells and several insulin sensitive tissues and play an important role in glucose homeostasis [15]. The binding of SARSCoV-2 Spike protein to ACE2 activates disintegrin and metalloprotease-17 (ADAM17) and induces ACE2 shedding via a process tightly coupled with TNF- α production. ADAM17 plays an important role in inflammation, it can cleave and thereby activate a variety of cytokines and their receptors [14].

Studies have demonstrated that persons with pre-existing cardiovascular disease have a heightened vulnerability to COVID-19 and tend to have more severe disease with worse clinical outcomes [2,9,10]. According to a meta-analysis by Singh et al., the prevalence rate of diabetes, cardiocerebrovascular disease, and hypertension was 9.7%, 16.4%, and 17.1% respectively in persons with COVID-19 [10].

2.1.2. Cardio-vigilance during the pandemic

As patients with underlying cardiovascular disease have poor clinical outcomes, it is important to monitor the underlying health status. Certain important points need consideration during the pandemic:

1. Patients attending a general check-up for their underlying condition should follow regional government guidelines for limiting the spread of the disease. As there is a constant rise in COVID-19 cases, people should avoid a hospital visit. People who need routine follow-up visits can opt for remote or tele-consultation. However, emergency visits in symptomatic patients should not be deferred. If people visit the hospital, they should wear a mask and maintain social distancing and practice hand hygiene.
2. Patients with hypertension should monitor their blood pressure at home regularly. Persons should be encouraged to perform self-monitoring of blood pressure using validated devices [16].
3. Utilizing ambulatory blood pressure monitoring (ABPM) can be recommended during the pandemic. Of note, 24-h ABPM can diagnose night-time hypertension, masked hypertension, and white-coat hypertension. The Indian ABPM study by Kaul et al. reported that using ABPM may prevent misdiagnosis in approximately one-third of all treated and untreated subjects. Hence, the use of ABPM can improve the diagnosis of hypertension while reducing the cost of healthcare [17]. Even though ABPM is a standard procedure for hypertension management in developed countries, it is not regularly utilized in developing countries such as India. The reasons being cost, needs proper guidance and supervision on measurement and lack of easy availability.

2.1.3. Cardiometabolically active drugs and consequences

Chloroquine and Hydroxychloroquine had initially shown some promise in treatment of COVID-19. Two small human studies in COVID-19 demonstrated improvement in some parameters in patients with COVID-19. However, controversy exists on the continued use of these drugs [18]. The Indian Council of Medical Research continues to advocate the use of HCQ for frontline workers in India [19].

Some of the CV drug interactions with HCQ to be considered in times of COVID-19 are summarized below [20].

- Macrolide antibiotics like Azithromycin and Quinolones like Ciprofloxacin are linked to QT prolongation and are recommended to be avoided
- Anti-arrhythmic drugs like amiodarone are also linked with QT prolongation and should ideally be avoided during the pandemic times
- Co-prescription with OADs and insulin requires strict monitoring of blood sugar levels
- Beta-blockers can be continued, but it should be noted that HCQ increases levels of these drugs and CV monitoring is advisable
- Digoxin can also be continued, but monitoring may be needed

Hypertension is a common comorbidity in persons with COVID-19. It is well known that ACE/ARBs inhibitors are commonly used in the treatment of cardiovascular diseases, including hypertension. However, earlier studies have reported the role of ACE inhibitors in upregulating ACE2 expression [21,22].

An observational study from a combined cohort of Germany and Netherlands patients, examined the association between antihypertensive agents used in people hospitalized with COVID-19 infection and outcomes. It demonstrated that no evidence of adverse outcomes with ACEI/ARB. Interestingly, beta blockers provided beneficial role in terms of milder course after admission to hospital. Whereas there was a significant association with poor outcomes in patient treated with Calcium Channel Blockers (CCB) [23].

The Cardiological Society of India (CSI) has also issued a position statement in this regard, stating that guideline directed drug therapy including ACEI/ARB/ARNI is to be continued in patients with pre-existing heart failure. CSI also says that cardiologists should continue using these drugs to prevent mortality due to heart failure and myocardial infarction, until further research on SARS-Cov-2 interaction with ACEi/ARB's shows a strong reason to stop these drugs [24].

Another class of drugs in focus in the pandemic have been the corticosteroids. The World Health Organization (WHO) addressed the role of systemic corticosteroids in the treatment of patients with COVID-19 in a recent communique on September 2, 2020 [25]. The results from retrospective studies are not supportive of corticosteroid use in COVID-19 despite the signals for some benefits, the RECOVERY trial found a significant reduction in death with dexamethasone only in severe case on ventilator or moderate case on supplemental oxygen therapy but no benefit observed in mild to moderate case requiring no oxygen [26].

In the context of these promising results, most protocols have now adopted dexamethasone in severe COVID-19 cases. However, one important therapeutic point to note in this regard is that steroid therapy may exacerbate hyperglycemia in people with diabetes and may unmask undiagnosed or silent diabetes. Furthermore, in people who are at risk of diabetes, steroid therapy may precipitate hyperglycemia and new-onset diabetes [27].

The therapeutic efficacy of oral agents in steroid-induced hyperglycemia remains unclear, therefore, insulin is the mainstay of

Table 1
Evidence on use of Anti Diabetic Agents in times of COVID-19.

Drug	Use in COVID-19
Metformin	Demonstrated protective antiproliferative and immunomodulatory effects [44]. Decreased mortality in lower respiratory infections [45]. Metformin use significantly reduced mortality in women with obesity or T2DM in observational study from individuals hospitalized with COVID-19. This sex-specific finding is probably due to metformin reducing TNF-alpha in females over males. Metformin benefits in COVID-19 might be through TNF-alpha effects [46]. Metformin use was associated with nearly 70% reduction in mortality in people with diabetes and COVID-19. It may provide a protective approach in this high risk population [47] Reduction in mortality in people with diabetes and COVID-19 among metformin users compared to non-users are well documented [48] Risk of lactic acidosis May offer cardiopulmonary protection in COVID-19 via enhanced ACE2 expression [49] Can be continued in mild to moderate COVID-19, Avoid in severe/critical stage.
SGLT2 inhibitors	Increased ACE2 expression in kidney. Risk of dehydration and diabetic ketoacidosis. Can be continued in mild COVID-19. Dose reduction and discontinuation in moderate to severe/critical stage.
GLP1-RA	Liraglutide increased ACE2 expression in lungs and heart [50], Risk of vomiting. Can be continued in mild COVID-19. Dose reduction and discontinuation in moderate to severe/critical stage.
DPP4 Inhibitors	DPP-4 inhibitors may hamper the sustained cytokine storm and inflammation in the lungs [51] Sitagliptin treatment reduced mortality and improved clinical outcomes in a multicenter, case-control, retrospective, observational study [52]
Thiazolidinediones	Increases ACE2 expression in liver and lungs [53] Risk of volume overload. Can be continued in mild COVID-19. Dose reduction and discontinuation in moderate to severe/critical stage.
Modern Sulfonylureas	No evidence for or against the use in COVID-19. Dose may have to be adjusted based on glycemic control. Risk of hypoglycemia. Can be continued in mild to moderate COVID-19. Avoid in severe/critical stage
Insulin	Can be continued at any stage. Main stay of treatment for hyperglycemia in severe/Critical stage of COVID-19. Dose adjustments to be done appropriately to reach therapeutic goals according to diabetes type, comorbidities, and health status. Risk of hypoglycemia [54].
Hydroxychloroquine	Approved as 3rd line agent for T2DM in India and repurposed agent thought to be of benefit for prophylaxis of COVID-19.

T2DM: Type 2 Diabetes Mellitus, TNF: Tumor necrosis factor, SGLT2: Sodium-glucose transport protein 2, DPP4: Dipeptidyl-peptidase 4, GLP1 RA: Glucagon like peptide 1 Receptor Agonist.

treatment in patients with persistent hyperglycemia ≥ 200 mg/dL [28]. Specifically, in cases with severe manifestations of COVID-19, guidance from a group of experts in the UK recommends giving correction doses of rapid-acting analogue insulin when capillary blood glucose >217 mg/dL. The group also recommends NPH insulin which has an intermediate duration of action for optimizing glycemic control. However, the metabolic effects of dexamethasone can persist for up to 36 h and clinicians can consider long acting basal insulin analogues for maintaining glycemic control [27]. Dose escalation by 20% may be required in patients already on insulin, but it is noted that rapid escalation by 40% or more may be required to control steroid-induced hyperglycemia. Finally, insulin resistance will fall steeply when dexamethasone is stopped, hence insulin dose adjustment should be monitored very closely to avoid hypoglycemia [27].

Statins are another class of drugs in focus during the COVID-19 pandemic. Animal studies have shown that mRNA and protein expression of toll-like receptors (TLR) and reduce downstream inflammation and oxidative stress. This could explain the beneficial effects of statins on the immune system. Data on the safety of statin therapy in COVID-19 era is sparse, however, expert opinion and observational studies continue to advocate the use of statins to improve cardiovascular outcomes in the COVID-19 era [29]. Theoretically statins may protect innate immune responses to viral respiratory infections through inhibiting the Myeloid differentiation primary response 88 (MYD88) pathway. The ability of statins to maintain MYD88 levels at normal levels, may be protective for patients with COVID-19 [30]. There is some emerging epidemiological evidence that statins may lead to fewer severe viral pneumonias [31] Therefore, clinicians may consider prescribing statins when indicated by current guidelines.

The frequent hypercoagulability observed in COVID-19 patients has also brought into focus the need for anticoagulation in the

pandemic era. A retrospective analysis of hospitalized patients suggests that aspirin use may have beneficial effects in patients with COVID-19. However, the authors suggest that clinicians need to carefully weigh the risk: benefit profile of aspirin in COVID-19 before making a clinical decision to initiate therapy [32].

2.1.4. Glucovigilance

The relationship between COVID-19 and adverse outcomes in patients with diabetes is well-documented. With the ongoing pandemic, routine care for diabetes patients has been impacted, therefore Misra et al. emphasize the need for reconnecting with patients and imparting appropriate prevention and management advice [33]. Further, in the absence of documented benefits of dietary interventions in COVID-19, Diabetes India has called for continuing the best practice to rely on traditional dietary advice with enhanced servings of proteins, local and seasonal fruits and vegetables to have a balanced diet [34].

There is a well-known relationship between diabetes mellitus and increased risk of infection [35]. Further, the co-existence of comorbidities significantly escalates the risk of poor prognosis in persons with COVID-19. Diabetes and Chronic Obstructive Pulmonary Disease (COPD) very often co-exist with cardiovascular disorders such as hypertension or coronary heart diseases [36]. The impaired innate immune system in persons with diabetes is one of the reasons hypothesized for the increasing number of COVID-19 cases in diabetic population. Usually persons with diabetes have impaired immune response to infection in relation to cytokine profile and changes in immune-mediated responses, including T-cell and macrophage activation [37]. Further poor glycemic control leads to impairment of the body's immune response to viral infection while predisposing to secondary bacterial infections in the lungs [38]. Diabetes mellitus is a pro-inflammatory state

Table 2
Resource challenges in COVID-19 pandemic.

Challenges in times of COVID-19	Resource Husbandry Solutions
Lack of Availability:	
A. Personal Protective equipment's (PPE)	Boost Local innovation & manufacturing of PPE.
B. Oral Anti Diabetic agents' non-availability	<p>a. Change brand names which is available.</p> <p>b. FDC non-availability give the drugs separately if available.</p> <p>c. Change within same class or different class of drugs.</p> <p>d. Breaking of scored or unscored tablets.</p> <p>e. Use government resources.</p>
C. Insulins' non-availability	<p>a. Substitution with oral drugs, if possible.</p> <p>b. Change brand names.</p> <p>c. Change to closely matching formulations.</p> <p>d. Change to different insulin.</p> <p>e. Use government resources: ample supply of insulin in government hospitals.</p>
Lack of Affordability	
A. Investigations non-affordability	Concept of Investigational Parsimony: encourages the use of minimal investigations for screening, diagnosing, monitoring and following up of a disease without adversely impacting patient wellbeing.
B. Therapeutic non-affordability	<p>a. Reduce the frequency of monitoring.</p> <p>b. Distribute investigations in 3 quarters.</p> <p>Concept of therapeutic parsimony: anchorage use of minimal therapeutic interventions to replace multiple ones, to achieve similar therapeutic outcomes.</p> <p>a. Use of cheaper substitutes/generics.</p> <p>b. Avoid prescribing non-essential drugs like costly multivitamins.</p>
Lack of Accessibility to Doctors	<p>a. Allowing refill of medicine for chronic medical illnesses like diabetes & hypertension by pharmacies based on their previous prescriptions.</p> <p>b. Volunteering amongst final year medical students and medical graduates who have the knowledge and capacity to treat common ailments.</p> <p>c. Leveraging Paramedics (nurses, pharmacist) to support & amplify doctors' capacity.</p> <p>d. Promote use of Telemedicine care.</p>

associated with exaggerated cytokine response. A study by Guo et al. has demonstrated significantly higher levels of inflammatory biomarkers, including IL-6, C-reactive protein, serum ferritin,

Box 1

Recommendations for management of cardiometabolic disorders during COVID-19 crisis.

1. Metformin, Modern sulfonylureas & DPP4 Inhibitors can be used in people with diabetes who presents with mild to moderate COVID-19 infection
2. Antidiabetic medications, including SGLT2i, GLP-1 RA, and TZD, should be considered for temporary dose reduction or discontinuation in people with diabetes who presents with moderate to severe COVID-19 infection.
3. Insulin is the mainstay of treatment in patients who have significant hyperglycemia and moderate to severe infection. Basal bolus is preferred treatment in severe appropriate cases
4. Treatment for hypertension with ACE inhibitors/ARB can be continued even during COVID-19 infection.
5. Encourage the utilization of self-monitoring of blood glucose and blood pressure measurements.
6. Encourage the adoption of resource husbandry principles to overcome challenges in times of COVID-19.
7. Encourage persons to use teleconsultation for regular check-ups.
8. Maintain glycemic control through diet, exercise, and medications.
9. Follow all government regulations (social distancing, wearing masks, hand hygiene, respiratory hygiene, avoiding unnecessary travel) imposed to curb the spread of disease.

coagulation index, and D-dimer, in persons with diabetes compared to person with-out diabetes [11]. These results support the fact that persons with diabetes are at a higher risk of developing an inflammatory storm, eventually leading to acute respiratory distress syndrome (ARDS) and rapid deterioration in COVID-19. Also, diabetes mellitus is associated with reduced expression of ACE2 and low ACE2 expression in DM is associated with an increased incidence of severe lung injury and ARDS in persons with COVID-19 [39].

Although diabetes has been associated with poor outcomes in persons with COVID-19, the susceptibility to SARS-CoV-2 infection is not higher in people with diabetes. There is not enough data to show whether people with diabetes are more likely to get COVID-19 than the general population. The American Diabetes Association (ADA) has also issued statements that people with diabetes are not more prone to COVID-19 than the general population [40]. New-onset hyperglycemia with or without diabetes has been associated with COVID-19 and reinforces findings that there may be a bidirectional relationship between diabetes and COVID-19 [41].

Obesity is also a risk factor for severe infection, and many persons with type 2 diabetes are obese. The studies conducted during the H1N1 epidemic demonstrated severe disease in obese persons, and the risk was higher in persons with abdominal obesity. Persons with abdominal obesity usually have respiratory problems, including reduced ventilation of the basal lung sections, and hence there is a higher risk of pneumonia and reduced oxygen saturation in these persons [42,43].

Further, certain drugs such as corticosteroids, lopinavir, ritonavir, type 1 interferons, and azithromycin used in the management of COVID-19 can also worsen glucose control [39]. Available evidence on the use of anti-diabetic agents is summarized in Table 1.

Insulin is the mainstay for optimizing glycemic control during the times of the pandemic. However, there is an urgent need to explore different insulin administration strategies especially in

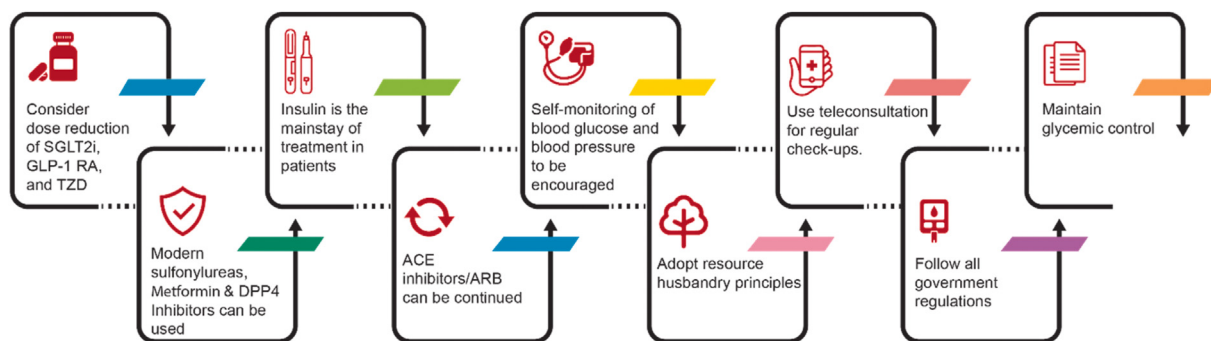


Fig. 1. Recommendations for management of cardiometabolic disorders during COVID-19 crisis.

hyperglycemic crisis stages experienced by COVID-19 patients. Basal insulin can be considered as the first line with basal bolus regimens opted for in hospitals [15].

Considering the high risk of infection in persons living with diabetes, extra precautions should be taken during the pandemic. Hence there is a need to adhere to certain norms, especially in persons with diabetes.

1. Strictly maintaining social distancing and proper hand and respiratory hygiene practices.
2. Avoiding nonessential travel. Teleconsultation with registered medical practitioners will help people with DM
3. Maintaining good glycemic control to boost innate immunity and reduce the risk and severity of infection: frequent self-monitoring of blood glucose is recommended in these times.
4. Stabilizing the cardiac or renal status of people with underlying conditions is necessary to avoid serious complications.
5. Attention to nutrition: Everyone, including people with underlying comorbidities, should have a balanced diet. Further, regular exercise improves immunity.
6. It is strictly advised to follow self-quarantine; this is especially recommended for elderly people with underlying comorbidities.
7. It is advisable to stick to ongoing therapies. However, the dosage of oral antidiabetic may need to be reduced in serious symptomatic cases.
8. Serious symptomatic cases will need to be converted to insulins.

2.5. Resource management in challenging times

The sudden emergence of the pandemic has imposed an enormous burden on healthcare facilities. Further, there is a lack of essential medications and non-availability of personal protective equipment (PPE) even in countries with the best healthcare facilities. As the emergence of the disease was rapid, the world was not prepared to handle a pandemic. Challenges in healthcare (Table 2) include lack of availability (of essential medicines, PPE kits), affordability and accessibility (to other treatment of other chronic diseases). In such a situation it is important for the public to appreciate the role played by doctors in managing the pandemic [55].

The ongoing crisis calls for an innovative approach to counteract the lack of resources - resource husbandry - this is a vital concept that needs to be promoted during these hard times to combat the shortage of medical resources while simultaneously providing effective treatment to the patients.

3. Optimizing use of telemedicine

Use of telemedicine for delivering routine care is now recommended by the Government of India. The Ministry of Health and Family Welfare, Government of India issued the Telemedicine guidelines on March 25, 2020. Formulated by NITI Aayog, which is a digital health policy that advocates use of digital tools for improving the efficiency and outcome of the healthcare system. These guidelines have been notified under the Indian Medical Council (Professional Conduct, Etiquette, and Ethics Regulation, 2002) [57].

Telemedicine can help improve access to healthcare, overcome the scarcity of specialists capable of managing epidemic diseases, and reduce the costs of healthcare and improve quality of care especially in times of natural disasters and pandemics. Telemedicine includes a wide array of tools physician's or patient's ease of handling these tools can optimize the usage of telemedicine during pandemic times [58].

There are challenges and limitations of telemedicine especially in developing countries; enhanced documentation and information governance may help avoid these issues [59].

4. Recommendations

Based on the available evidence, the expert panel put forward certain recommendations for the management of cardiometabolic disorders during the pandemic (Box 1) (see Fig. 1).

SGLT2i: Sodium-glucose co-transporter-2 inhibitors; GLP-1 RA: glucagon-like peptide1-receptor agonists; TZD: Thiazolidinediones

5. Summary and conclusions

Persons with COVID-19 having cardiometabolic comorbidities are at an increased risk of severe disease and ARDS, eventually leading to mortality. This paper reviews the need for cardio protection and glucovigilance in these extraordinary times and provides simple guidance for physicians to manage chronic conditions like type 2 diabetes and cardiovascular disease in covid-19. Be innovative in developing cost effective resource husbandry.

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