

# In-patient Care for People with COVID-19 and Diabetes in Myanmar

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## INTRODUCTION

These recommendations are synthesized from international references coupled with expert advice from endocrinologists and doctors caring for patients with COVID-19, to help guide physicians in Myanmar in managing persons with diabetes who are admitted.

## UPON ADMISSION

Blood glucose should be checked in all patients admitted to the hospital. Additionally, blood ketone testing should be done in all patients with diabetes especially those with an initial blood glucose greater than 12 mmol/L (Table 1).<sup>1</sup> COVID-19 disease precipitates atypical presentations of diabetic emergencies such as mixed diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar state (HHS), and thus, we need to be alert for these conditions. Laboratory criteria for hyperglycemic emergencies are presented in Table 2. Hyperglycemia may also be caused by new onset diabetes, sepsis, missed treatments for diabetes and systemic steroids.<sup>1</sup>

**Table 1.** Ketone levels and appropriate steps

Blood ketones	Interpretation/recommendation
<0.6 mmol/L	Safe
1.5 to 2.9 mmol/L	Increased risk for DKA <sup>a</sup>
≥3 mmol/L	Check venous blood gas pH and bicarbonate

<sup>a</sup>DKA, diabetic ketoacidosis  
Adapted<sup>1</sup>

**Table 2.** Criteria for diagnosis of hyperglycemic emergencies

Parameter	DKA <sup>a</sup>	HHS <sup>b</sup>
Blood glucose	>11 mmol/L <sup>c</sup>	≥30 mmol/L
Ketones	Blood ≥3 mmol/L, Urine ≥+2	–
pH	<7.3	>7.3
Serum bicarbonate	<15 mEq/L	–
Serum osmolality	–	>320 mOsm/kg

<sup>a</sup>DKA, diabetic ketoacidosis  
<sup>b</sup>HHS, hyperglycemic hyperosmolar state  
<sup>c</sup>can be <11 mmol/L if on sodium glucose cotransporter 2 (SGLT2) inhibitor treatment, pregnant and/or has severe COVID-19 infection  
<sup>d</sup>calculated as (2 x Na) + glucose + urea  
Adapted<sup>1</sup>

## BLOOD GLUCOSE TARGETS

The target glucose range for majority patients with diabetes whether critically ill or not, is 7.8 to 10.0 mmol/L (140 to 180 mg/dL),<sup>2,3</sup> keeping in mind that individualization of goals should still be done in consideration of the severity of the infection and the age of patients (Table 3).

**Table 3.** Individualized glycemic recommendations

Patient Profile	Fasting blood glucose	2-hour postprandial or random blood glucose
Mild presentation of COVID-19	4.4 - 6.1 mmol/L	6.1 - 7.8 mmol/L
Severe or critically ill COVID-19	7.8 - 10.0 mmol/L	7.8 - 13.9 mmol/L
Older with mild COVID-19 or use of glucocorticoids	6.1 - 7.8 mmol/L	7.8 - 10.0 mmol/L

Adapted<sup>4</sup>

## FREQUENCY OF GLUCOSE MONITORING

Among patients who are able to eat regularly, glucose monitoring should be performed before each meal, and more frequently e.g., every 4-6 hours among those who are not eating. In resource limited settings, blood glucose (BG) monitoring two times a day is satisfactory.

## INSULIN ADVICE

In all diabetes patients, previous insulin use should always be inquired. Among persons with known type 1 diabetes, basal insulin should always be continued, as DKA may result with insulin discontinuation.

Subcutaneous or intravenous insulin should be initiated for those with persistent blood sugar elevation at levels ≥10.0 mmol/L (≥180 mg/dL).<sup>3</sup> Those who are very ill or unable to eat may benefit from intravenous insulin infusion. An alternative subcutaneous (SC) insulin regimen may be used in mild to moderate DKA, or in the absence of an infusion pump for intravenous insulin.<sup>1</sup>

In the intensive care unit (ICU), continuous intravenous insulin infusion is the best method of delivery, with blood glucose monitoring every 2 hours. A basal + correction regime is an alternative. Significant insulin resistance has been seen in people with type 2 diabetes in ICU settings, and intravenous insulin protocols may need amending, as there have been reports of patients requiring up to 20 units/hour.

Outside of the ICU, SC short or rapid-acting insulin may be given before meals if the patient is able to eat, or every 6 h if no meals are given or if the patient is receiving continuous enteral/parenteral nutrition.<sup>5</sup> Basal insulin or a basal plus correction regimen is preferred. If the patient is eating, insulin injections are scheduled before meals. For those who have poor oral intake, a safer procedure might be to administer the rapid-acting insulin immediately after eating. A recommended strategy for insulin initiation is given in Table 4.

**Table 4.** Calculation of the total daily insulin dose

Age, year	eGFR <sup>a</sup> , mL/min/1.73 m <sup>2</sup>	BG <sup>b</sup> on admission, mg/dL	Total daily dose of insulin, unit/kg/day
>70	<60		0.2 to 0.3
<70	>60	140–200	0.4
<70	>60	201–400	0.5

<sup>a</sup>eGFR, estimated glomerular filtration rate; <sup>b</sup>BG, blood glucose Adapted<sup>6</sup>

The calculated total daily dose is distributed as 50% basal insulin and 50% correctional insulin. Basal insulin is given once (detemir/ glargine) or twice (NPH/ detemir) daily, being injected at the same time each day.

**Correction with rapid-acting insulin analog or regular insulin**

Subsequently, insulin doses are adjusted according to the results of bedside BG measurements (Table 5). If a patient is able and expected to eat all or most of his/her meals, correction doses are given before each meal and at bedtime following the usual column. If a patient is not able to eat, the correction doses are given every 6 hours following the insulin-sensitive column.

**Table 5.** Recommended correction doses of insulin

Blood glucose, mg/dL	Additional correction dose		
	Insulin-sensitive	Usual	Insulin-resistant
141-180	2	4	6
181-220	4	6	8
221-260	6	8	10
261-300	8	10	12
301-350	10	12	14
351-400	12	14	16
>400	14	16	18

Adapted<sup>6</sup>

If the fasting and premeal plasma glucose are persistently above 140 mg/dL in the absence of hypoglycemia, it is recommended to increase the selected insulin scale from insulin-sensitive to usual, or from usual to insulin-resistant.

If a patient develops hypoglycemia (defined as BG <70 mg/dL), regular or rapid-acting insulin should be decreased and the patient category classified from insulin-resistant to usual, or from usual to insulin-sensitive.

**FLUID MANAGEMENT**

The recommended fluid replacement for hyperglycemic emergencies may be individualized in patients with evidence of pulmonary edema or myocarditis. The recommended amount of required intravenous fluids may be reduced to half to avoid exacerbating adult respiratory distress syndrome. Involvement of the critical care team is also recommended. In situations where ketosis is observed to persist despite appropriate treatment, the use of 10 to 20% glucose may be considered.<sup>1</sup>

**OTHER ANTI-DIABETIC AGENTS**

Sulphonylureas are known as a drug class to increase the risk of hypoglycemia and are thus, generally avoided in hospitalized patients with severe medical illness.<sup>1</sup>

The use of dipeptidyl peptidase-4 (DPP-4) inhibitors in individuals with COVID-19 and concomitant clinically significant volume depletion or sepsis may necessitate dosage adjustment due to a reduction in renal function.<sup>7</sup>

SGLT2 inhibitors and metformin should be discontinued in all admitted patients.<sup>1</sup>

Although glucagon-like peptide-1 receptor agonists (GLP-1RA) safely lower blood glucose in short term studies of ventilated patients with critical illness, there is insufficient experience in critically ill subjects to make therapeutic recommendations for use of these agents in the context of coronavirus infection.<sup>7</sup>

**Statement of Authorship**

The authors certified fulfillment of ICMJE authorship criteria.

**Author Disclosure**

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