Managing Hyperglycaemia and Reducing Glycaemic Variability In Critically Ill COVID-19 Patients

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Aim: To evaluate if a safe reduction in the carbohydrate content received from enteral feeding improved the time in range of COVID-19 patients in critical care

Background:

- Patients critically ill with COVID-19 frequently present with significant, sustained hyperglycaemia, despite high intravenous insulin doses (>10 units/hr) [1]
- Hyperglycaemia and a high glycaemic variability has been associated with poorer patient outcomes in critical care in a variety of different cohorts including COVID-19 patients [2,3,4]
- There is limited data on interventions to improve glycaemic control in this high risk patient cohort

Materials & Methods:

Intervention: A safe reduction in the carbohydrate content received from enteral feeding.

Defined as a 30% reduction in carbohydrate delivered per hour, which was achieved by individualised hourly enteral feed rate reductions, while still keeping in the recommended 20-30 kcal/kg/ideal body weight/ day for patients in critical care.

Population: Patients admitted to the ICU at St Thomas' hospital with COVID-19 as reason for admission between Dec 2020 and Feb 2021

Inclusion Criteria:

- Sustained hyperglycaemia: blood glucose levels >10 mmol/L for >24 hours
- Intravenous insulin requirement >5 units/ hour for >24 hours
- Managed with continuous enteral tube feeding and intravenous insulin primarily
- On >6mg/day of dexamethasone or equivalent

Exclusion Criteria:

- End stage renal disease or on dialysis

Results:

Of the 21 patients studied , 14 (66.7%) were male, 15 (71.4%) had type 2 diabetes, median (range) age and BMI were 57 years (25-80), and 29 kg/m2 (24.0-70.1) respectively.

Pre-intervention, patients received median (interquartile range) 77.3 kcal/hour (71.7-87.5) from enteral feeding and median (interquartile range) 69.2 kcal/hour (63.0-73.6) post intervention, P=0.000.

TIR increased significantly post intervention , more than doubling from median (interquartile range) 20.0% (7.63-40.2) to 47.1% (24.3-56.3) with an associated decrease in TAR and mean blood glucose level, P<0.05 for all. There was also a significant decrease in intravenous insulin requirement after intervention. falling from median (interquartile range) 8.96 units/hour (6.97-10.4) to 5.22 units/hour (4.25-7.59) P<0.05.

Outcome Measure, median (interquartile range)	Before reduction in carbohydrate content from enteral feeding (n=21)	After reduction in carbohydrate content from enteral feeding (n=21)	P value
Time in range (%)	20.0 (7.64-40.4)	47.1 (24.3-56.3)	0.001*
Time below range (%)	0.00 (0.00-6.73)	0.00 (0.00-5.88)	0.721
Time above range (%)	73.9 (52.8-92.4)	50.0 (39.9-72.4)	0.003*
Mean blood glucose level (mmol/L)	12.4 (10.3-14.7)	10.5 (9.8-11.7)	0.006*

Conclusions: In a cohort of critically ill COVID-19 patients, a safe reduction in carbohydrate content from enteral feeding improved glycaemic control and reduced glycaemic variability with a more than doubling of TIR. Subsequent, larger studies are needed to confirm our findings, though our results establish a scientific rationale for such future work.

References: **1.)**Bode B, Garrett V, Messler J, et al (2020) Glycemic Characteristics and Clinical Outcomes of COVID-19 Patients Hospitalized in the United States. J Diabetes Sci Technol. **2.)**Holman N, Knighton P, Kar P, et al (2020) Risk factors for COVID-19-related mortality in people with type 1 and type 2 diabetes in England: a population-based cohort study. Lancet Diabetes Endocrinol. **3**.) Shen Y, Fan X, Zhang L, et al (2021) Thresholds of Glycemia and the Outcomes of COVID-19 Complicated With Diabetes: A Retrospective Exploratory Study Using Continuous Glucose Monitoring. Diabetes Care 2019:dc201448. **4.)** Krinsley JS (2008) Glycemic variability: A strong independent predictor of mortality in critically ill patients. Crit Care Med. **5.).**Feldman EL, Savelieff MG, Hayek SS, Pennathur S, Kretzler M, Pop-Busui R (2020) Covid-19 and diabetes: A collision and collusion of two diseases. Diabetes 69(12):2549–2565.