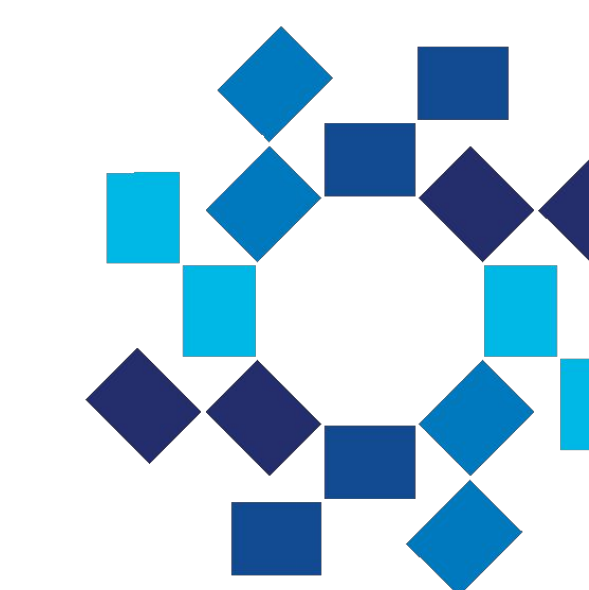


# Euglycemic Ketoacidosis:

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## LEARNING OBJECTIVES

1. Euglycemic ketoacidosis can be a side effect for patients on SGLT2 inhibitors.
2. Euglycemic ketoacidosis poses high risk with patients on a Keto diet.

## CASE PRESENTATION

- 57 year old female PMH of T2DM presents to the emergency department with complaints of fatigue.
- Since the beginning of the COVID pandemic she was experiencing weight gain and increased blood sugar.
- She was seen by her Endocrinologist two weeks prior to admission who started her on Invokamet.
- Her sister has Graves' disease.
- In addition, 8 days prior to admission she started a keto diet. Since starting the new medication and changing her diet she reports a 5 lbs weight loss and has seen improved diabetic control based on blood sugars that had previously been consistently in the 200s (recently in 70s and 80s).
- She remained in her normal state of health until two days prior to admission when she began experiencing SOB, tachycardia, and fatigue. Pt states she also has low back pain and nausea.

## PHYSICAL EXAMINATION

- BP: 152/68, HR: 116, Temp: 97.5F, Resp: 20, SpO2: 98%
- She was tachycardic and tachypneic on PE.

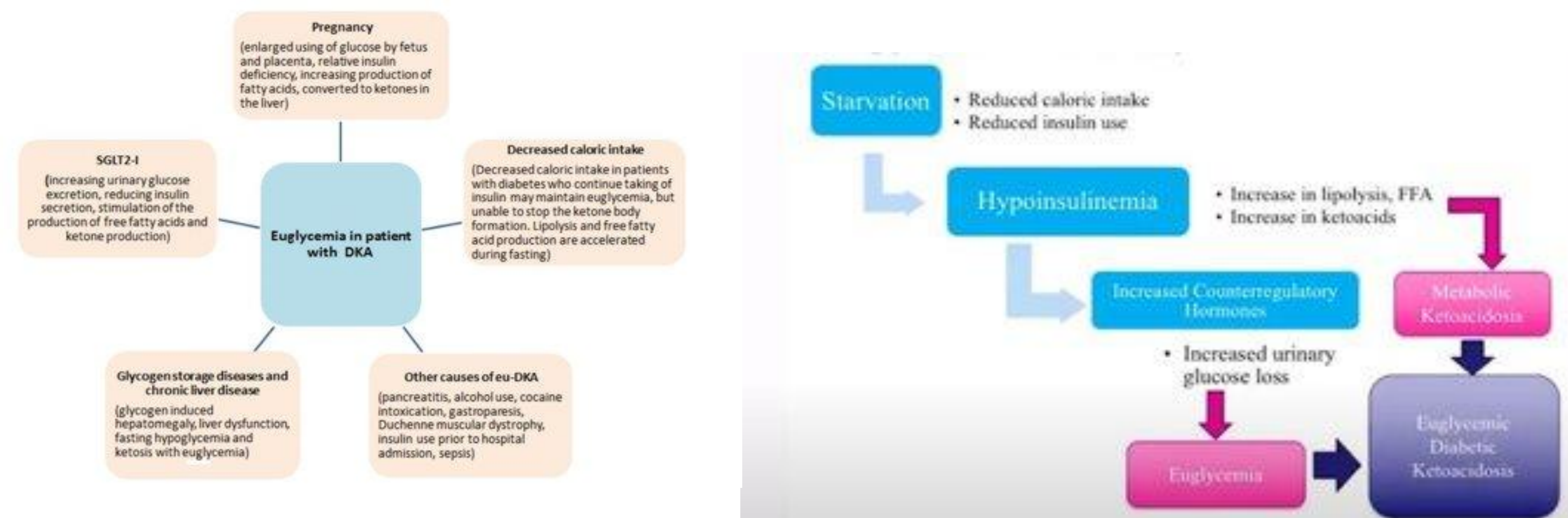
## LABORATORY DATA

CMP: Glucose 114, anion gap 19.0 Lactate: 1.2

Urine Analysis: Specific gravity 1.057, glucose >500, Ketones 80.0, Protein qualitative 30.0

ABG: pH (m): 7.136, pCO2: 23.6, pO2: 104.8, O2 Sat: 97.4, HCO3: 7.8

## PATHOPHYSIOLOGY



## DKA vs Euglycemic Ketoacidosis

### Diabetic Ketoacidosis with Hyperglycemia

- Presentation
  - Thirst, polyuria, abdominal pain, N/V, weakness
  - Kussmaul respirations, fruity breath, tachycardia
  - Dehydration – osmotic diuresis
  - Precipitating event (infection, lack of insulin administration)
  - Electrolyte abnormalities

### -Labs

- Blood glucose > 250 mg/dL
- Elevated serum and urine ketones
- ABG – low pH, low HCO3, low CO2 (compensation)
- Possible hypokalemia

### Euglycemic Ketoacidosis

#### •Presentation

- Generalized malaise, shortness of breath, nausea, vomiting, anorexia
- Abdominal pain
- + or - polyuria
- Kussmaul respirations, fruity breath
- Dry mucous membranes
- Tachycardic

#### - Labs

- Blood glucose <250 mg/dL
- Elevated serum and urine ketones
- Metabolic acidosis pH < 7.3, Bicarbonate < 18
- Hypokalemia, hypomagnesemia, hypophosphatemia

## CONCLUSIONS

### Euglycemic Diabetic Ketoacidosis Treatment:

- Replacement of fluid losses
  - NS with D5 to avoid hypoglycemia
- Correction of hyperglycemia
  - 0.05 - 0.1 U/kg - lower doses required
  - Check blood glucose every hour
- ICU admission for close hemodynamic and laboratory monitoring
- Keto diet:
  - Low carbs, <20-50 g/day; low protein, high fat
  - Who does it? - Aiming for weight loss, glucose control reduce the frequency of epileptic seizures
- Abnormal labs to expect in patients on Keto diet?
  - - Elevated LDL, increase in cholesterol (followed by reduction?), improved glucose control

## SUMMARY

- Detailed history, lab work, and high index of suspicion is necessary to distinguish between DKA and Euglycemic Ketoacidosis
- In Euglycemic Ketoacidosis, blood glucose will be <250 mg/dL and classic symptoms of DKA may be absent.
- Prompt replacement of fluids and correction of glucose is necessary for appropriate management.

## REFERENCES

1. Lisenby, Katelin M., Allison Meyer, and Nicole A. Slater. "Is an SGLT2 inhibitor right for your patient with type 2 diabetes." *J Fam Pract* 65.9 (2016): 587-93.
2. Le, Tao and Bhushan, Vikas. *First Aid for the USMLE Step 1 2020, Thirtieth edition*. New York: McGraw-Hill Education, 2020.
3. Beitelshes, Amber L., Bruce R. Leslie, and Simeon I. Taylor. "Sodium-Glucose Cotransporter 2 Inhibitors: A Case Study in Translational Research." *Diabetes* 68.6 (2019): 1109-1120.
4. Trachtenberg, David E. "Diabetic ketoacidosis." *American family physician* 71.9 (2005): 1705-1714.