DIABETES MANAGEMENT & THE IMPACT OF COVID-19

Mary Annette Hess, PhD, FNP-BC, CNS, COI
Moffett & Sanders School of Nursing
Samford University

DISCLOSURE

- Annette Hess has nothing to disclose.

OBJECTIVES

- Review Diabetes & COVID19 (CV19)
- Review Diabetes Management During & Beyond CV19
- Review the Goals of Diabetes Management during Covid
- Identify Covid Immunizations, Antibodies, & Medication Management

DIABETES EPIDEMIC

34.2 million

$327 Billion

COVID DATA

- **As of September 2021:** United States COVID-19 Cases, Deaths, and Laboratory Testing (NAATs) by State, Territory, and Jurisdiction - Data provided by CDC
  - **Total Cases:** 42,234,211+ 91,205 New Cases
  - **Cases Last 7 days: 916,413**
  - **Total Deaths: 675,071 + 1,334 New Deaths**
- Alabama
  - **Total Cases** in 2021- **390,286**
  - **Deaths** in 2021 - **6,482**
  - **Positive** NAAT (Covid testing) Tests in 7 days - **10,067**

DIABETES & COVID-19

- The COVID-19 pandemic:
  - Significant challenge for the care of patients with severe chronic conditions – Diabetes & many other
  - Pragmatic approach to categorizing patients in
    - low-risk
    - intermediate-risk
    - high-risk groups
  - Significant need of refinement as new data emerge

COVID & DIABETES

- Diabetes: Significant Vulnerability to Covid-19
- 3 x more likely as nondiabetes to develop a severe case of Covid-19
- Individuals with chronic health disease, Diabetes, CV, CKD, BMI > 30, HGA1c > 8, etc, have an increased risk of severe Covid-19
- Bidirectional relationship between Covid-19 and Diabetes.
- Also, new onset diabetes and complications of existing diabetes are observed in patients with Covid-19
  - 14% hospitalized COVID patients developed "new onset" diabetes
- Significant Challenges

AMERICAN DIABETES ASSOCIATION (ADA):

- Insufficient data to support the exact risk of COVID-19 on existing diabetes patients (ADA, 2020)
- Individuals with diabetes have worse outcomes with higher rates of serious complications and morbidity
- Resources Utilized for the remaining content
  - Diabetes Res Clin Pract. 2020 Aug; 166: 108347.
  - Published online 2020 Jul 22. doi: 10.1016/j.diabres.2020.108347
  - Diabetes Care 2020 Aug; 43(8): 1695-1703.https://doi.org/10.2337/dc20-1192
  - *The Journal of Clinical Endocrinology & Metabolism*, Volume 105, Issue 9, September 2020, Pages 3076-3087, https://doi.org/10.1210/clinem/dgaa342

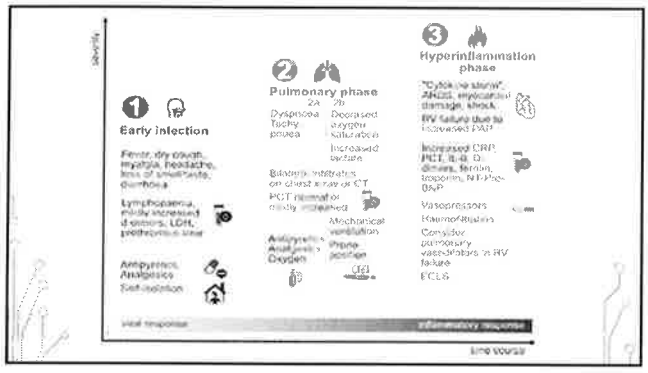
MANY QUESTIONS RELATED TO DIABETES & CV19

- An International Group of leading diabetes researchers participating in the CoviDIAB Project have established a global registry of patients with Covid-19-related diabetes (https://covidiab.e-dendrite.com/).
- **Goal: establish the extent and phenotype of new-onset diabetes defined by hyperglycemia, confirmed Covid-19, a negative history of diabetes, and a history of a normal glycated hemoglobin level (A1c).**
- Expanded Study: patients with preexisting diabetes presenting with severe acute metabolic disturbance – to identify appropriate care for patients during and after Covid-19.

F. Rubino, M.D. & S. A. Amiel, M.D.

PATHOPHYSIOLOGY OF DIABETES

- **Bodily Attributes to Diabetes**
  - Brain: Neurotransmitter dysfunction – Cognitive decline
  - Liver: Increased hepatic glucose production – Increases free glucose
  - Muscles: Decrease Glucose Uptake – Decreased use of glucose & Increases fee glucose
  - Pancreas / Beta Cells: Decrease insulin secretion – Decrease insulin & increases glucose
  - Islet / Alpha Cells: Increased glucagon secretion – Increases glucose
  - Adipocytes: Increased lipolysis – Increase fat breakdown - Ketosis
  - Kidney: Increased glucose reabsorption – Increases glucose
  - Gut: Decreased Incretin effect - Decrease insulin release – Increases glucose



ACE2: ANGIOTENSIN-CONVERTING ENZYME 2 RECEPTORS

- ACE2: originate from key metabolic organs and tissues (Protective & Lowers BP)
  - Protein regulating cell function --- Receptor of COVID virus entry into the epithelial cells of the Lungs
    - Pancreatic beta cells
    - Adipose tissue
    - Small intestines
    - Kidneys
- Covid-19 virus (SARS-CoV-2) binds to ACE2 receptors
  - Leads to alterations in glucose metabolism
  - Complication existing diabetes
  - May cause new cases of diabetes

The New England Journal of Medicine; August 2020

Replicates quickly in the upper airways, generating high virus concentrations facilitating transmission

COVID PATIENTS WITH DIABETES SYMPTOMS - 5 EXPLANATIONS: PAUL ZIMMET, MD (AJMC, 2020)

- Virus may directly attack insulin-producing beta cells in pancreas
  - Pancreas produces ACE2 Receptors – KEY access for SARS-CoV-2 to enter the cells then proliferates
  - Leading to a diagnosis of Atypical Diabetes – not type 1 or type 2
- Virus may indirectly attack insulin production
- Acute Stress and Inflammation causing diabetes symptoms
- Treating COVID with Steroids raises blood glucose – double dose of elevated sugar in the blood
  - Treatment: High doses of insulin

DIABETES COMPLICATIONS ARE SERIOUS

- Macro- and Microvascular diseases
  - Eyes
  - Kidneys
  - Heart
  - Peripheral Vascular System
  - Periodontal
- Lipid metabolism
- Platelet function
- Neuropathy
  - Autonomic
  - Peripheral

GLYCEMIC CONTROL IS CRUCIAL – NEW DATA

- Prevent or Delay Diabetes Complications
  - A1c – glucose average over 3 months - < 6.5 – 7.0
  - Blood Glucose < 180
  - Time in Range (TIR) – new data supporting time spent in target glucose range – each 5% increase is significant – Desired goal 70-180 mg/dL or 70% of the time - (Diabetes Care, 2019;42: 1593-1603)
  - Blood Pressure
  - Lipid Levels
  - High risk patients for ASCVD, CKD, or HF
    - Establish Treatment Goals
    - Consider Residual CV risk
    - Limit Hypoglycemia
    - Be mindful of weight
    - Encourage adherence
    - Achieve Glycemic control

DIABETES PATIENTS WITH COVID MANAGEMENT

- Goal: Blood glucose <180 mg/dL
- Insulin basal, prandial, and correction doses
- If not insulin, then What:
  - Dipeptidyl Peptidase-4 (DPP-4): Sitagliptin (Januvia) – not saxagliptin (onglyza) and linagliptin (tradjenta) during Covid due to increased risk of Heart Failure – HF
  - Monitor Renal function with Sitagliptin during Covid
- Use with Caution: (Contraindicated in situations)
  - Sulfonylureas due to hypoglycemia risk (not for renal insufficiency pts)
  - Glucagon-like peptide receptor antagonists (GLP-1 RAs) due to N/V requiring adequate hydration to avoid dehydration
  - Metformin – increases risk of **acidosis** (Administer with caution) with Lung dz, Renal impairment, hemodynamic instability, & hypoxia

COVID PRECAUTIONS & DIABETES MEDICATIONS

- Insulin – Long acting and Fast acting insulins – best choice during Covid
- DPP4:
  - Sitagliptin (Januvia 100mg qd) – not saxagliptin (onglyza) and linagliptin (tradjenta) during Covid
- GLP1
  - Cautious due to N/V requiring adequate hydration to avoid dehydration
    - Victoza / Trulicity / Bydureon / Ozempic
- Metformin

  Contraindicated in patients with or at risk of acidosis, including those with hemodynamic instability, hypoxia, and/or severe renal impairment
- Sulfonylurea
  - Sulfonylureas due to hypoglycemia risk (not for renal insufficiency pts)
  - Glimepiride / Glipizide / Glyburide

MEDICATIONS CONTRAINDICATED & STRATEGIES DURING CV-19

- Avoid:
  - Glucagon-like peptide receptor antagonists (GLP-1 RAs) due to N/V
  - TZDs – increases fluid retention and heart failure
  - SGLT-2 Inhibitors: no data supporting usage during COVID – increases the risk of volume depletion and ketoacidosis (DKA)
- Monitor BG every 2-4 hours – CGM
- Prevent COVID contact and the spread
- Telehealth visits with Provider, Nurse, and/or Pharmacists – Frequently

COVID VACCINATION SUCCESS IN TREATING CV-19 VIRUS

- As of September 2021, one COVID-19 vaccine approved by the U.S. Food and Drug Administration (FDA), and two have been authorized for emergency use.
- **Pfizer, Inc., and BioNTech BNT162b2: FDA approved vaccine** called Comirnaty – ages >16
- **ModernaTX, Inc., mRNA-1273:**
  - On December 18, 2020, the FDA authorized emergency use of this NIH-funded COVID-19 vaccine in the United States for people age 18 and older
- **Janssen Pharmaceutical Companies of Johnson & Johnson:**
  - FDA authorized emergency use of this single-shot vaccine for people age 18 and older. Developed with support from NIH, this vaccine does not require special refrigeration.
  - In women, rare risk of blood clots after vaccination

MONOCLONAL ANTIBODIES: CASIRIVIMAB AND IMDEVIMAB

- Emergency Use Authorization only – not approved by FDA
- IV or SQ Prophylactic Treatment prior to Hospitalization
- High Risk Patients Progressing to Severe COVID-19
  - 65 yo or greater
  - BMI > 25 kg/m2
  - Pregnancy
  - CKD
  - Diabetes
  - Immunosuppressive Disease or Treatments
  - CVD or Hypertension
  - Chronic Lung Disease
  - Sickle Cell Disease
  - Neurodevelopmental Disorders
  - Medical Dependance – Trache / Gastrostomy / Positive Pressure Ventilation not related to CV-19
- Not available to patients – Hospitalized with COVID-19; on Oxygen or Increase O2 flow rate due to CV-19
  - After Hospitalization – Remdesivir is the treatment of Choice

REMDESIVIR

- Intravenous nucleotide prodrug of an adenosine analog which binds to the viral RNA-dependent RNA polymerase
- Inhibits viral replication through premature termination of RNA transcription against SARS-CoV-2
- Approved by the Food and Drug Administration (FDA) treatment of COVID-19 in hospitalized adult / children (aged ≥12 years and weighing ≥40 kg)
- FDA Emergency Use Authorization (EUA) for the treatment of COVID-19 in hospitalized pediatric patients weighing 3.5 kg to <40 kg or aged <12 years and weighing ≥3.5 kg
- Administered in hospital or health care setting similar to inpatient hospital
- Studied in several clinical trials for the treatment of COVID-19
- The safety and efficacy of combination therapy of remdesivir with corticosteroids not rigorously studied in clinical trials - combination therapy may be beneficial in some patients with severe COVID-19
- **Dose:** 200 mg IV once, then remdesivir 100 mg IV once daily for 4 days or until hospital discharge
- https://www.covid19treatmentguidelines.nih.gov/therapies/antiviral-therapy/remdesivir/

IVERMECTIN

- Anti-parasitic drug – approved by FDA to treat these infections
- Not recommended by CDC for COVID treatment
- Used in Humans and Farm Animals
  - Dose for Humans & Animals is DIFFERENT!
  - Humans can overdose on Animal dosing leading to SERIOUS side effects
  - Human Ivermectin has specific inactive ingredients that have been studied for safety
  - Animal Ivermectin has specific inactive ingredients that have not been studied or are at larger quantities than safe human doses
    - These inactive ingredients could potentially affect the absorption of the drug into the body or may be dangerous for human consumption.
    - https://www.fda.gov/consumers/consumer-updates/why-you-should-not-use-ivermectin-treat-or-prevent-covid-19

HEALTH GOALS (ADA, 2020)

- HGB A1C:
  - < 6.5% AACE
  - < 7.0 % ADA
- TIR: 70-180 – 70% of the time
- Fasting Blood Glucose (FBG) 70-130 mg/dL
  - AACE < 100 mg/dL
  - ADA < 110 mg/dL
  - 2 hrs postprandial < 180mg/dL
- Blood Pressure (BP) <130/80 mmHg
- Total Cholesterol <200
  - LDL <100 mg/dL
  - HDL > 40 mg/Dl for males
  - HDL > 50 mg/Dl for females
- Insulin 6.0 – 25.0
- GFR: > 60 & > 30 for Metformin continuation
- Triglycerides <150 mg/dL
- Body Mass Index (BMI) < 25.0
- Waist Circumference
  - < 35 Women
  - < 40 Men
- hsC-Reactive Protein: Risk for CV dz
  - Low risk: less than 1.0 mg/L
  - Average risk: 1.0 to 3.0 mg/L
  - High risk: above 3.0 mg/L

IF YOU HAVE QUESTIONS, JUST ASK!

mhess2@samford.edu

THANK YOU!