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Case Report
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Euglycemic Diabetic Ketoacidosis in a Patient with Type 2 Diabetes Mellitus on Sodium- Glucose Cotransporter-2 Inhibitors Induced by COVID-19

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Abstract

A 47-years old lady presented to the emergency department complaining of severe symptoms of lower respiratory tract infection of three days duration. She has history of type 2 diabetes on Dapagliflozin, is one of the sodium- glucose cotransporter-2 inhibitor. Clinical, radiological and laboratory tests confirmed the diagnosis of moderate COVID-19 pneumonia and euglycemic diabetes ketoacidosis. The patient admitted to the intensive care unit for better management and discharged home after nine days of hospitalization. We reporting, COVID-19 could induce this serious metabolic abnormality. Therefore, clinicians should be aware of this complication in this current pandemic.

Case Description

A 47 years old female patient with history of Type 2 Diabetes Mellitus (T2DM) for 6 years and was on Metformin 1000 mg twice daily. She attended other health care facility and Dapagliflozin 10 mg once daily was added due to poor control DM with HbA1c of 10.%. Two weeks later presented to the emergency department of this hospital of three days history of severe symptoms of lower respiratory tract infection in form of temperature, cough and shortness of breath. Initial assessment demonstrated the patient had low oxygen saturation, tachypneic, with tachycardia however, blood pressure maintained. Temperature: 38.0°C and BMI 38.1 kg/m^2. Therefore, immediate management applied by giving 10 liters of oxygen/min, steroids, anticoagulation and antibiotics. e-DKA diagnosed on the laboratory tests results (Table 1) mandate transfer the patient to the Intensive Care Unit (ICU) to continue the management of the eu-DKA according to the hospital protocol approved by endocrinology and ICU departments of this hospital. Tocilizumab added to the treatment following COVID-19 pulmonary changes seen on chest X-ray and moderate pneumonia of HRCT scan of the chest (Figure 1, 2). PCR of the nasal swab was positive for the virus. ECG was normal sinus rhythm without ischemic changes or heart blocks and cardiac enzymes were within normal ranges. Other causes of DKA and acidosis were excluded and the patient has no history of alcohol intake or taking any other drug. The patient improved on the following days and transferred to the general medical ward to continue COVID-19 and diabetes management. After 9 days of hospitalization, the patient discharged home and advised to discontinue Dapagliflozin and avoid SGLT2 inhibitors group.

Discussion

SGLT2 inhibitors drugs including Canagliflozin (Invokana), Dapagliflozin (Forxiga) and Empagliflozin (Jardiance) are approved by the US Food and Drug Administration (FDA) for use in T2DM in 2013 and 2017 for a new drug Ertugliflozin. These also considered in patients with (T1DM) Type 1 Diabetes Mellitus [1]. In 2015, many organizations warned about the association of DKA with SGL2 inhibitors. In May 2015, based on the report of 20 cases, the FDA released a warning concerning the potential increased risk of SGLT2 inhibitors associated DKA in both T1DM and T2DM patients [2].

The Centers for Disease Control and Prevention (CDC) has indicated that adults with T2DM are at an increased risk of severe morbidity and mortality with Coronavirus Disease 2019 (COVID-19) infections [3]. Patients with poor diabetes control are at higher risk of more severe COVID-19 and have higher mortality rate regardless the age [4]. Other factors, such as obesity, comorbidities, metabolic syndrome and a chronic subclinical inflammatory state might be responsible for a

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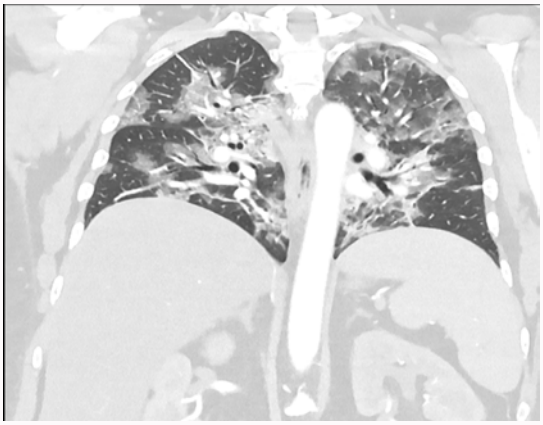

Figure 1: Chest X-ray.

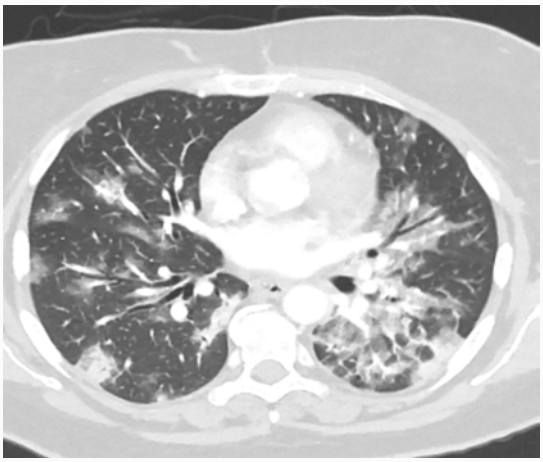

Figure 2: HRCT scan.

Table 1: The lab tests results.

Lab test	Normal range	Result
Random plasma glucose	3.89-7.7 mmol/L	10
Serum Bicarbonate	22-29 mmol/L	9
Serum pH	7.35 and 7.45	7.1
Anion gap	< 10 mEq/L	26
Base deficit	± 2 mEq/L	-20
Lactate	0.5-1 mmol/L	3.2
PO2 mmHg	80-100 mmHg	60
PCO2 mmHg	35-45 mmHg	58
Serum ketones	<0.6 mmol/L	3.5
Urinary ketones	Negative	+++
Blood urea	2.5-7.6 mmol/L	2.4
Serum creatinine	50.4-98.1 umol/L	58.4
Serum potassium	3.5-5.1 mmo/L	3.9
Serum sodium	136.0-145.0 mmol/L	140
Serum Chloride	98-107 mmo/L	109
D-dimers	0.00-0.50 ug/mL	2.74
INR	0.80-1.20 Ratio	11.5
Ferritin	15.00-120.00 ng/mL	367
LDH	125-243 U/L	379
Hemoglobin	11.5-16.0 g/dL	15.2
WBC count	4-11 10^3/uL	5
Neutrophil count	1.80-7.70 10^3/uL	9.7
Lymphocyte count	1-4.80 10^3/uL	0.47
Platelet's count	150-450 10^3/uL	211
CRP	0.0-5.0 mg/L	186
Procalcitonin	≤ 0.15 ng/mL	0.25

preferential association between COVID-19 and T2DM rather than T1DM [5]. Obesity is an important independent risk factor for the severity of COVID-19 [6].

The patient in this case has many risk factors of ominous outcome including, poor DM control (HbA1c 10.0%), grade II obesity (BMI 38.1 kg/m^2) and moderate severity pneumonia according to the HRCT scan in addition to the eu-DKA. The management is challenging in those sick patients with many risk factors requires ICU admission. The addition of the steroid in the treatment of hypoxemia of COVID-19 is worsening the glycemic control. Furthermore, the fluid therapy in eu-DKA is different from the classic DKA because of the normal glycemic level in the blood. The fluid contains glucose are needed in the initial stage and not later as in the classic type by increase glucose administration using higher percentages of dextrose (10% or 20%) are required to facilitate the concomitant administration of the relatively large amounts of insulin that are needed to correct the severe acidosis in these patients [7].

The hospital stay of this patient was nine days and there were no complications throughout this period despite of the initial severity of the illness because COVID-19 infection trigger ketosis or ketoacidosis, and induced diabetic ketoacidosis in patients with diabetes and increased the length of hospital stay and mortality. In a study 42 patients developed ketosis out of 658 admitted for COVID-19. Three patients out of fifteen with background of diabetes developed DKA [8]. In a study by Gorthi R, five patients with diabetes presented with DKA induced by COVID-19. One of the two patients with T2DM was on Empagliflozin presented with eu-DKA. This male patient was 65 years old with BMI 30.34 kg/m^2 improved and discharged home however was very sick under mechanical ventilator [9]. While Morrison N, reported a similar case of COVID-19 induced eu-DKA in a male patient in his 40s with T2DM on the same drug had with mild respiratory symptoms thorough the course of the illness [10]. Patients with severe COVID-19 required optimized care and support for better outcome. The strongest hospitalization risks are age more than age 65 years, BMI>40 and heart failure whereas the most important for critical illness, are SpO2<88, procalcitonin >0.5, troponin <0.1, age >64 and CRP>200 [11].

Physicians should be aware of the potential rare serious DKA side effects of the SGLT 2 inhibitors. DKA is rare side effect induced by many stress conditions including COVID-19 is unlikely to affect the clinical use of SGLT2 inhibitor with approved appropriate benefits in decrease HbA1c, weight reduction and cardiovascular protective. Therefore, we recommend to withhold these drugs in acute illness.

References

1. Cherney DZ, Perkins BA. Sodium-glucose cotransporter 2 inhibition in type 1 diabetes: simultaneous glucose lowering and renal protection? Can J Diabetes. 2014;38(5):356-63.

2. U.S. Food and Drug Administration. Drug Safety Communication: FDA

warns that SGLT2 inhibitors for diabetes may result in a serious condition of too much acid in the blood. 2015.

3. Benoit SR, Zhang Y, Geiss LS, Gregg EW, Albright A. Trends in diabetic ketoacidosis hospitalizations and in-hospital mortality - United States, 2000-2014. MMWR Morb Mortal Wkly Rep. 2018;67(12):362-5.
4. Pinto Lana C, Bertoluci Marcello C. Type 2 diabetes as a major risk factor for COVID-19 severity: A meta-analysis. Arch Endocrinol Metab. 2020;64(3):199-200.
5. Drucker DJ. Coronavirus infections and type 2 diabetes-shared pathways with therapeutic implications. Endocr Rev. 2020;41(3).
6. Caussy C, Wallet F, Laville M, Disse E. Obesity is associated with severe forms of COVID-19. Obesity (Silver Spring). 2020;28(7):1175.
7. Barski L, Eshkoli T, Brandstaetter E, Jotkowitz A. Euglycemic diabetic ketoacidosis. Eur J Intern Med. 2019;63:9-14.
8. Juyi L, Xiufang W, Jian C, Xiuran Z, Hongmei Z, Aiping D. COVID-19 infection may cause ketosis and ketoacidosis. Diabetes ObesMetab. 2020;22(10):1935-1.
9. Ramya Gorthi S, Ghassan K, Sandeep D, Ravi PN. COVID-19 presenting with diabetic ketoacidosis: A case series. AACE Clin Case Rep. 2021;7(1):6-9.
10. Morrison N, Barnett K, Tantum J, Morrison HK, Whalen M. A case of euglycemic diabetic ketoacidosis in a patient with type 2 diabetes mellitus and COVID-19. Cureus. 2020;12(12):e12029.
11. Petrilli CM, Jones SA, Yang J, Rajagopalan H, O'Donnell L, Chernyak Y, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. BMJ. 2020;369:m1966.