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Case Report

# Euglycemic Diabetic ketoacidosis in Covid-19 Patient: A Case Report

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## ABSTRACT

Cases of euglycemic (glucose value often <200 mg / dl) diabetic ketoacidosis have been reported due to sodium-glucose co-transporter 2 inhibitors (SGLT2i) used in the treatment of type 2 diabetes mellitus. Patients with diabetes suffer a more severe Covid 19 infection. In addition, cases of eglycemic diabetic ketoacidosis in covid 19 patients have been published in the literature. In this report, we describe a case of a 59-year-old women patient who presented with an elevated anion gap metabolic acidosis during a SARS-CoV-2 infection and was diagnosed euglycemic diabetic ketoacidosis.

## INTRODUCTION

Euglycemic diabetic ketoacidosis is a life-threatening emergency. Euglycemic diabetic ketoacidosis is diagnosed as the: increase in anion gap metabolic acidosis, glucose level <200mg / dl and ketone detection in serum or urine. Euglycemic diabetic ketoacidosis is not uncommon in patients using sodium-glucose co-transporter 2 inhibitors (SGLT2i) [1]. Patients using SGLT2i should be followed in this regard. Urinary glucose loss and osmotic diuresis increase in SGLT2i users. Glucose loss in urine creates a carbohydrate deficit. This lowers the glucose level. The insulin decreases and the, insulin sensitivity increases which results in increased lipogenesis in adipose tissue. SGLT2i increases glucagon synthesis and ketone absorption. Due to the increase in glucagon synthesis, there is increased gluconeogenesis in the liver and increased lipogenesis in adipose tissue. As a result of these events, euglycemic diabetic ketoacidosis occurs [2].

The risk for Diabetic Ketoacidosis increases when patients with type 2 diabetes have Covid 19. Patients using SGLT2i increase the risk further. Eglycemic diabetic ketoacidosis develops more frequently in patients using SGLT2i.

## CASE

A 56-year-old female patient was admitted to Kırıkhan hospital with complaints of fever, weakness and cough, and was hospitalized with the diagnosis of covid 19 disease and referred to our service because of deep metabolic acidosis. The patient had type 2 diabetes mellitus and arterial hypertension in her history. (she used empagliflozin, sitagliptin, metyformin, piaglitazone and amlodipine). In physical examination, blood pressure was 120 / 70mmHg, body temperature was 36.5°C, pulse rate was 98 / min, and other examinations were normal. The patient's body weight was 74kg, height 161cm, and body mass index was 28.5kg / m2. Laboratory

findings of the patient for glucose was 125mg / dl (74-106) blood urea nitrogen 7.9mg / dl (6-20), serum creatinine 0.4mg / dl (0.5-0.9), C reactive protein 214mg / dl ( 0.0.5), sodium 132mmol / l (136-145), potassium 4.4mmol / L (3.5-5.5) and chlorine 95mmol / L (98-107). Arterial blood gas increased anion gap (25) metabolic acidosis was detected. The patient's arterial blood gas follow-ups at her arrival and after treatment are given in table 1. Urine density was found to be 1023, urine pH 5.5 glucose (+++) and ketone (+++) in urinalysis on 27.02.2021. PCR test for covid 19 was positive. Thoracic tomography of the patient was reported as a multifocal patchy infiltrative ground glass within some area consolidation in the peribronchial subpleural area in all zones. In the treatment of the patient, 1000cc saline was given for 2 hours, then it was reduced to 150cc per hour. In addition, 10% dextrose was started at 100cc / hour and 5 unit regular insulin per hour. In the control urinalysis on 01.03.2021, urine density was 1003, pH 6.5 urine glucose (+++), and ketone negative. The patient was discharged with recommendations.

Table 1: Arterial blood gas monitoring.

| | 26.02.2021 | 27.02.2021 | 28.01.2021 | 01.03.2021 |
|---|---|---|---|---|
| pH | 7,2 | 7,0 | 7,15 | 7,3 |
| PCO2 | 20,8 | 24,3 | 30,8 | 39,8 |
| HCO3 | 9,2 | 6,7 | 11,1 | 21,5 |
| Sodium | 143 | 132 | 134 | 133 |
| potassium | 4,3 | 4,3 | 3,4 | 3,2 |
| chlorine | 95 | 95 | 104 | 103 |
| Anion gap | 38,8 | 30,3 | 18,9 | 8,5 |

## DISCUSSION

COVID19 is a highly pathogenic and contagious viral infection, first identified in Wuhan, China's Hubei province. The Covid 19 pandemic has significantly increased hospitalizations due to pneumonia. Covid 19 includes a clinical spectrum that can lead to asymptomatic infection, mild upper respiratory disease, pneumonia, severe symptoms of acute respiratory distress syndrome, multiorgan failure, and even death [3-4].

During the Covid 19 pandemic, the risk of developing diabetes mellitus and diabetic ketoacidosis increased. Diabetic ketoacidosis, hyperglycemic hyperosmolar coma and euglycemic diabetic ketoacidosis may develop in patients with diabetes mellitus and Covid 19. The development of diabetes mellitus complications increases mortality. Covid 19 is directly toxic on pancreatic islets cells. Insulin-producing cell death increases and insulin production decreases. In addition, increased inflammatory cytokines such as IL6 may play a role in hyperglycemia. Cytokine storm may contribute to the increased incidence of euglycemic diabetic ketoacidosis in COVID-19 patients receiving SGLT2i. Gastrointestinal symptoms (nausea, vomiting and anorexia) that develop in patients with Covid 19 cause a decrease in volume and increase in fat breakdown. This situation causes the production of ketone bodies to increase. All of these increase the risk of diabetic ketoacidosis in covid 19 patients. It is recommended to discontinue SGLT2i and start insulin in patients with Covid 19. The frequency of diabetic ketoacidosis is less than 0.1% in patients using SGLT2i. In the meta-analysis performed, diabetic ketoacidosis was 63.4%, hyperglycemic hyperosmolar coma 1.4%, combined diabetic ketoacidosis and hyperglycemic hyperosmolar coma 26.8%, and euglycemic diabetic ketoacidosis 8.5% in covid 19 patients. The mortality rate was 32.4%. SGLT2i was associated with euglycemic diabetic ketoacidosis. In the study, Chamorro-Pareja et al. a total of 50 covid 19 and diabetic ketoacidosis patients were included. Of these patients, 44 were diagnosed with type 2 diabetes mellitus and 6 with type 1 diabetes mellitus. Also, 8 patients had undiagnosed diabetes mellitus. Twenty patients were using oral hypoglycemic agents (2 patients were using SGLT2i) and 24 patients were using insülin. Acute kidney injury developed in 76% of the patients and 22% required renal replacement therapy. Mortality rate was determined as 50% [5-10].

Vitale et al. reported 5 cases of euglycemic ketoacidosis during covid 19 disease in patients with type 2 diabetes mellitus using SGLT2i. Four of the patients were using empagliflozin and one using canagliflozin. One of the patients died, 3 of them needed rehabilitation and the other patient was discharged home. A 56-year-old patient presented with euglycemic diabetic ketoacidosis, hypertension and type 2 diabetes mellitus (using losartan, metformin, empagliflozin, linagliptin). In the treatment of the patient, hydration, 10% dextrose, 120cc per hour and 4 regular insulin per hour was started, and potassium replacement was performed. In another case, a 52-year-old male patient using empagliflozin presented with a case of euglycemic diabetic ketoacidosis during covid 19 with the diagnosis of type 2 diabetes mellitus. Hydration and insulin were started in the treatment [5,7,11].



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As a result, the risk of diabetic ketoacidosis increases in patients with covid 19 and increases mortality. In addition, the risk of diabetic ketoacidosis increases more in covid 19 patients using SGLT2i. Eglycemic diabetic ketoacidosis is more common in patients using SGLT2i. Discontinuation of SGLT2i seems appropriate in patients with severe covid 19 symptoms.

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