

## Case Report

# The treatments of COVID-19 patient with diabetes mellitus: a case report

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## ABSTRACT

Diabetes mellitus or uncontrolled blood sugar is one of the factors causing the severity risk of COVID-19 infection. The researchers from China and Italy also find a profound connection of the old age patients who have chronic illness comorbid are tend to have a higher risk of enduring serve COVID-19, and have a higher number of deaths. Until this report is written, there are no medicines nor vaccines to treat COVID-19 completely. This article reports KTK, a 57 years old woman, Balinese, was diagnosed with COVID-19 and was treated because of the loss of consciousness. Patient had already done the op debridement amputation for left foot digit II-V and the wound of the patient got worsen. Patient also had blood sugar variability which complicated the insulin therapy and inhibits the patient's recovery. On her way, the patient's respiratory system got worsen. Diabetes is strongly connected with a higher risk of severe COVID-19 and has a higher death rate compared to controlled blood sugar. The purpose of the guidance for COVID-19 patients with Diabetes is to prove that comprehensive glycemic control and blood glucose monitoring have a good result of the treatments for COVID-19 patients with Diabetes, also reduce the complication from the comorbid of chronic illness (diabetes), and avoiding the undesirable possibilities about the treatments.

**Keywords:** COVID-19, Diabetes mellitus, Treatment

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a transmitted disease caused by Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 is a new type of coronavirus which has not been identified in humans before. SARS-CoV-2 is firstly identified in December 2019 and until this report is written, has caused 35 million reported cases in 188 countries.<sup>1</sup> The general signs and symptoms of COVID-19 infection in most reported studies such as acute respiratory distress syndrome, fever, coughing, and breathing difficulties.<sup>2</sup> The average incubation phase is 5-6 days and the longest takes until 14 days. Several studies indicated this virus spreads from droplets, and contact with infected objects, and current study also debated about possibility of aerosol spread. In

severe COVID-19 cases, it causes pneumonia, acute respiratory syndrome, kidney failure, and even death.<sup>1,2</sup>

Even though COVID-19 can infect almost every age range, lot of studies that related to diabetes and cardiovascular disease in the old age group and people with a history of chronic illness (co-morbid) have a higher risk to get infected and with worse complications from this disease.

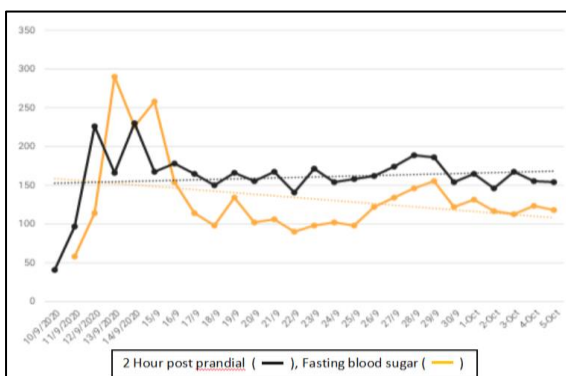
Diabetes Mellitus or uncontrolled blood sugar is one of the factors causing the severity risk of COVID-19 infection.<sup>2</sup> So far, there is no medicine nor vaccine SARS-CoV-2 for COVID-19 confirmed effective in treatment with lest side effect including glycemic control or blood sugar monitoring.<sup>1</sup>

## CASE REPORT

A female patient KTK, 57 years old, Balinese, lives in Wibisana, a seller in the Kumbasari market, a Hindu, was treated in Wangaya General Hospital on 10th September 2020 with a loss of consciousness (GCS = 7) as the main issue, fatigue, and nausea but without puking. Patient was having nausea since 3 days ago, while the loss of consciousness happened two hours before arriving in the hospital. The patient had done op debridement amputation for left foot digit II-V 3 weeks ago with rapid test result was negative. After the surgery, patient had bed rested for quite a while before was treated in hospital. Any history of contact with Covid-19 infected patients was denied by the patient and family, during the time, the patient was bed resting and meals were brought by family members. The patient had contact with only family members. The history of previous illness is Diabetes mellitus type 2 since 15 years ago, patient consumes Metformin 3 times a day and Glimepiride once a day. Diabetes mellitus has been known since 15 years ago. Any history of illness of cholesterol, liver, uric acid kidney, and lungs was denied by the patient. The patient does not smoke nor drinks any alcohol. There is no family member with the same illness. There is no allergic to medicines nor foods.

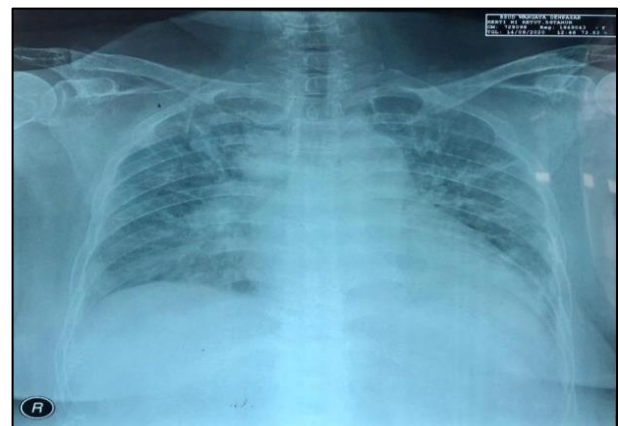


**Figure 1: Diabetic foot in the left foot of KTK, diabetes mellitus patient at Wangaya regional public hospital.**



**Figure 2: Patient blood sugar chart per day of KTK, diabetes mellitus patient at Wangaya regional public hospital.**

The result from physical examination such as general condition was unconscious with somnolent consciousness, weight 70 kg and height 150 cm, body mass index (BMI) 31,10 kg/m<sup>2</sup> with the impression of level 1 obesity, blood pressure 100/54 mmHg, pulse 94 time/minute, enough volume, respiration 20 times per minute, body temperature 36,50 C and oxygen saturation 98%. In the head examination, there was found anemic conjunctiva, sclera was not icteric, lips were not cyanosis, faring was not hyperemic. The results of the examination of the neck, heart, and abdomen were within normal limits. For the legs examination, there was no edema, the tips of the toes were cold, feet were pale, the sensitivity of both right and left foot was the same, there was a post-amputation surgery wound in digit II-V in the left foot, the edge of the wound was hyperemic, the wound did not fester, did not bleed, pulsation of dorsalis pedis artery was palpable.



**Figure 3: Thorax X-Ray show infection on both lung of patient KTK, diabetes mellitus patient at Wangaya regional public hospital 3 weeks after hospitalization.**

The result of laboratory check-ups on 10 September 2020 was leukocyte  $21.91 \times 10^3/\mu\text{L}$ ; erythrocyte  $3,18 \times 10^6/\mu\text{L}$ ; hemoglobin 8.9 g/dl; hematocrit 27.7%; thrombosis 448.000/uL; BSA 40 mg/dl; blood Na 132 mmol/L; blood K 4.9 mmol/L; blood Cl 93 mmol/L. and the result of rapid test for SARS-CoV-2 IgG was reactive and SARS-CoV-2 IgM was non reaktif. Whilst the result of laboratory check up on 11th September was albumin 2.0 g/dl; SGPT 28 U/L; SGOT 80 U/L; BUN 39 mg/dl; SC 0.8 mg/dl. The result of AGD was pH 7.48; PCO<sub>2</sub> 33 mmHg; PO<sub>2</sub> 109 mmHg; cHCO<sub>3</sub> 25 mmol/L; ABE 2 mmol/L; SBC 26 mmol/L; SO<sub>2</sub> 99%.

According to anamneses, both physical and laboratory check-ups, and supporting examination, the concluded diagnoses are Hypoglycemic with type 2 Diabetes Mellitus (DMT2), Diabetes Mellitus Diabetic Foot (DMDF), post-amputation digit II-V pedis Sinistra, Hypoalbumin, sepsis suspected and probable COVID-19. Patient is treated with drip D10% 20 drops/min; D40% 3 kolf; Levofloxacin 1x750 mg IV dan Vitamin C 2x600 mg IV in ER.

In the first week, the patient was still complaining about nausea, puking, and pain in the left foot. There were no breathing difficulties complained by the patient, with the saturation never touched under 97%. The result of the PCR test was positive and re-examination was done with the same result. The result of the regular blood sugar test showed a variety of fluctuation which was above the expected result. As the data is shown from figure 1. The standard regiment therapy for COVID-19 was done to the patient. With medicines were given such as Hydroxychloroquine 1×40 mg for 10 days, tamiflu 2×75 for 7 days, azithromycin 1×500, vitamin C 2×600 mg/day during the treatment with additional antibiotic levofloxacin 1×750 mg, paracetamol 3×500, ketorolac and when needed. Novorapid 3×10 IU and Lantus 8 IU with strict monitoring based on a patient's blood sugar as the diabetes treatment.

In the second week, the blood sugar of the patient started to be under control with insulin therapy was updated to Novorapid 3×16 IU and Lantus 16 IU. The Hypoglycemic of the patient was getting better with DMT2, DMDF post-amputation digiti II-V pedis Sinistra, Hypo albumin, suspect sepsis, and COVID-19. The drip therapy was changed into NaCl 0.9%, transfusion PRC was planned until Hb 10 g/dl (1 kolf/day premed Lasix). A therapy was added for the lungs Ondancetron 3×1 amp, Omeprazole 2×1 vial.

PRC transfusion was done in the third week and was starting into the 2 kolf and the results of laboratory check-up were: Leukocyte 15.10×10<sup>3</sup>/uL, Erythrocytes 3.60×10<sup>3</sup>/uL, Hb 9.9 g/dl, Ht 31.4%, Thrombocyte 485.000/uL. The result of CRP 85 mg/L; D-Dimer 2.344 ng/ml FEU, Lovenox 0.4 was given and Azytromycin was stopped.

The thorax image is cardiomegaly, lungs edema, and pneumonia. The results of the second and third PCR swab tests were SARS-CoV-2 positive. The patient did not have any complaint about nausea and puking anymore. The better condition of the patient was felt because of the under control of blood sugar.

In the fourth week of treatments, the patient was complaining about nausea and fatigue, the hard breathing was getting worse. The results of physical check-up were: oxygen saturation 90%, AGD: pH 7.44; pCO<sub>2</sub> 37 mmHg; pO<sub>2</sub> 33 mmHg (KRITIS); cHCO<sub>3</sub> 25 mmol/L; ABE 1 mmol/L; SBC 26 mmol/L; SO<sub>2</sub> 69%. The patient was moved to the ICU, breathing with ventilator Mode CPAP peep=10. After the intubation was done and with ventilation CPAP agd showed an improvement, with the result: AGD: pH 7.47; pCO<sub>2</sub> 36 mmHg; pO<sub>2</sub> 102 mmHg; cHCO<sub>3</sub> 24 mmol/L; ABE 0 mmol/L; SBC 25 mmol/L; SO<sub>2</sub> 98%.

The patient showed improvement and slowly the ventilator was lowered with keeping the saturation at 98% until the 26th day, the ventilator was taken off and the patient used

NRM 13 lpm. From the 5th PCR swab test (30th September 2020) the result was till SARS-CoV-2 positive.

## DISCUSSION

Diabetes is one of the most painful and highest death rate illness in the world. This is because diabetes causes complications both microvascular and macrovascular complications, which affect the surviving level of diabetes patients.<sup>1</sup> It is commonly known that diabetes is closely related to illness from all of the bacterial infections (pneumonia), virus (influenza), and wound complication (gangrene and secondary infection).<sup>2</sup> It is not different from virus infection of influenza A, SARS, and MERS, there is also found a strong connection of the abnormality of blood sugar as a strong predictor of the severity level in this pandemic cases.<sup>3,4</sup> The researchers from China and Italy also find a profound connection of the elderly patients who have comorbid of chronic illness, tend to have a higher risk of enduring serve COVID-19, and have a higher number of deaths compared to the controlled ones.<sup>5,6</sup>

In the reported patient, the imbalance of blood sugar at the beginning of the treatment was probably caused by the SARS-CoV-2 infection, which triggered heavier stress with the release of hyperglycemic hormones (glucocorticoid and catecholamine) causing the increase of the blood sugar to vary.<sup>7</sup> Hyperglycemic and insulin-resistant increase the glycosylation end product (AGEs), cytokine inflammation, oxidative stress, and molecule adhesion which mediate the inflammation.<sup>8</sup> Besides hyperglycemic, hypoglycemic also often happens in SARS-CoV-2 infection. In the hypoglycemic phase, a mobilization of pro-inflammation monocyte happens and increases the reactivity of the platelet which contributes to the number of cardiovascular in diabetes patients.<sup>9</sup> A strict observation has to be done to be able to control and monitor the patient's blood sugar level to prevent a heavier inflammation which can worsen the patient's condition. A treatment with the basal insulin and prandial is highly needed with the adjustment of the dosage when the injection of the insulin is going to be done. This is much recommended to adjust the patient's need for insulin so the blood glucose variability can be minimalized.

Until this report is written, there is no medicine nor vaccine found to cure COVID-19 completely. Many clinical trials have been done to see the efficacy and safety of some potential medicines for COVID-19. One of the pharmacology options which is believed to be promising is the usage of chloroquine and hydroxy analog hydroxychloroquine which are used to cure malaria, autoimmune illnesses and also have potential as wide spectrum anti-viral medicine. In the most recent study, it is found that in the in-vitro way chloroquine is very effective to control SARS-CoV-2 infection by increasing the pH endosomal and disturbing glycosylation from SARS-CoV-2 outside receptor, this is to be believed to block the COVID-19 infection.<sup>10</sup> The clinical trial in China shows



that chloroquine is superior in lowering the level of painfulness, preventing the exacerbation from pneumonia, increasing the negativity level of virus conversion, and an improvement in radiology without any serious side effects.<sup>11</sup> Chloroquine also has an immune modulator effect and anti-inflammation, while hydroxychloroquine is also found to increase the control glycemic level in patients with diabetes.<sup>10,12</sup> So, the usage of these medicines is worthy as a cure for SARS-CoV 2 with diabetes.

Besides this, the usage of corticosteroids in SARS-Cov-2 also can be reviewed. Acute lung damage and ARS are caused by the overreaction of the body to the lungs infection, meanwhile, corticosteroid does not only suppressing the inflammation in the lungs but also suppressing the body's immune response. This can lead to the increasing of opportunistic infection or co-infection because of the obstructed immune system and the decrease of clearance pathogen from the usage of corticosteroid.<sup>13</sup> From the study, it is shown that the benefits of corticosteroids are still doubtful. This is because of the delayed RNA clearance that is found and the increase of the death rate along with the unstable blood sugar complication, psychosis, and vascular necrosis.<sup>13</sup> Even WHO does not recommend the usage of corticosteroid outside the clinical trials and severe cases.<sup>14</sup> This makes us have to be careful to use corticosteroid on SARS-CoV-2 patients, especially with diabetes comorbid. The usage of corticosteroids has to be based on the case with the risks and conditions of the patient during the treatment as the consideration.

Controlling the hyperglycemia will improve the symptoms, reducing not only the risk of acute complications but also the other infections and complications related to hyperglycemia. Insulin subkutan with a daily injection regimen or basal will be the best option of the treatment to get the controlled glycemic. In patients with significant hyperglycemic (>300 mg/dl), insulin therapy that is recommended such as intravenous insulin drip, the higher dosage of insulin, or more often correction with fast working insulin. Providing the right and adequate will make it possible to control the glucose in deciding whether to increase or decrease the steroid dosage.

## CONCLUSION

Diabetes is one of the most painful and highest death rate illnesses in the world. This because diabetes causing both microvascular and macrovascular complications which can affect the survival rate of diabetic patients. The researchers from China and Italy also find a profound connection of the elderly patients who have comorbid of chronic illness (including diabetes), tend to have a higher risk of enduring the severe COVID-19, and have a higher number of deaths compared to the controlled ones. The purpose of the guidance for COVID-19 patients with Diabetes is to prove that comprehensive glycemic control and blood glucose monitoring have a good result of the

treatments for COVID-19 patients with Diabetes, also reduce the complication from the comorbid of chronic illness (diabetes), and avoiding the undesirable possibilities about the treatments.

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