DOI: 10.7860/JCDR/2022/56403.16888

Case Report

Pathology Section

COVID-19 Infection in a Sickle Cell Anaemia Patient from Sudan

ABDELRAHIM MAHMOUD MUDDATHIR

ABSTRACT

Sickle Cell Disease (SCD) is an inherited disorder with variable clinical presentation and low immunity. Coronavirus Disease-2019 (COVID-19) is a pandemic disease with a high-risk in chronic disease patients and older adults. SCD is widely distributed in Sudan; many SCD patients are infected with COVID-19. Despite this, no published data is available. This case report demonstrated the haematological and clinical course of a Sudanese sickle cell anaemia patient with COVID-19. A 20-year-old male patient was admitted to a hospital for 15 days. Demographic and clinical data were obtained from his medical records. A blood sample was taken at the time of admission and during hospitalisation. Tests were performed during admission, including Complete Blood Count (CBC), liver function test, renal function test, coagulation studies, viral screening, and urine general. The patient was diagnosed with COVID-19 using the Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test based on the nasopharyngeal swab and COVID-19 IgG and IgM using Enzyme Linked Immunosorbent Assay (ELISA) for the previous infection. The patient received intravenous fluids, antibiotics, analgesia, oxygen supplementation, and blood transfusion two times during hospitalisation, and there was no need for Intensive Care Unit (ICU) admission. The patient's prognosis was good; he was discharged on day 16 with no symptoms and a negative result of the COVID-19 PCR test. A severe illness was expected because he was infected twice by COVID-19, the patient showed mild clinical symptoms with a good prognosis, so further studies are required to understand COVID-19 among Sudanese SCD patients.

Keywords: Coronavirus disease, Complete blood count, Haemoglobin S

CASE REPORT

A 20-year-old male reported with a chief complaint of fever, cough, and joint pain for two days. He was diagnosed with homozygous SCD two years back. He was regularly taking 5 mg of folic acid each day. He had a history of hospital admission due to painful Vaso-Occlusive Crisis (VOC) and Acute Chest Syndrome (ACS) for three-five days. He had auto-splenectomy and cholecystectomy at 13 and started taking hydroxyurea three times a week.

On day one, an investigation was performed at the hospital, including the following: Complete Blood Counts (CBC), liver function test, renal function test, and urine general. Laboratory test data included a white blood cell count of 12.99×10^9 cells/L, Haemoglobin (Hb) 7.76 g/dL, Haematocrit (HCT) 18.5%, platelets 220.8×10^9 cells/L with normal renal and liver function tests, and clear urine analysis. Screening tests for Hepatitis B Surface Antigen (HBsAg), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV) were negative.

On day two, no investigation was requested, and the patient suffered from high body temperature (37.8°C) and generalised pain. He was under treatment of ceftriaxone intravenously every 12 hours for five days. Also, he took a 500 mg paracetamol tab every six hours.

On day three, he presented a SpO_2 of 86% and a temperature of 39°C. Supplemental oxygen was indicated, and he also lost both senses of smell and taste. Hence, the physician requested a nasopharyngeal swab for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). He also said he suffered from the same symptoms with cough and generalised pain six months ago. He did not make an investigation for COVID-19 at that time. He isolated himself at home for two weeks, took pain relievers, and did not required hospital, so COVID IgG and IgM were requested. Clinical examination showed mild hepatomegaly. The laboratory investigations asked on day three included CBC, liver profile, renal profile, C-reactive protein, lactate dehydrogenase, ferritin level, and coagulation study, as shown in [Table/Fig-1,2]. The laboratory investigation of the patients started to show signs of haemolysis. His haemoglobin was reduced to 2.45 g/dL, LDH level was increased from 345-726 IU/L, and total bilirubin was raised from 2.7-4.3 mg/dL. Also, signs of inflammation began, and his white blood cell count was 14.86×10^9 cells/L. CRP increased from 32.42-66.95 mg/dL, and serum ferritin was increased from 934-2730.4 ng/mL. Ceftriaxone and clarithromycin were given one tablet of 500 mg every 12 hours for five days.

Investigation	Normal range	Day 1	Day 3	Day 4	Discharge day (Day 16)	After 1 month
WBC (10^9/L)	4.8-10.8	12.99	14.13	14.86	13.1	13.05
RBCs (10^{12}/L)	4.7-6.1	2.89	1.01	2.55	2.05	2.99
HGB (g/dL)	14-18	7.76	2.45	8.18	7.25	9.36
HCT (%)	42-52	18.5	16.2	23.9	20.6	26.6
MCV (fL)	80-100	97.9	100.6	93.7	105.6	100.8
MCH (pg)	27-31	35.8	34.9	32.1	37.2	35.5
MCHC (%)	32-36	36.5	34.7	34.2	35.2	35.2
PLTs (10^9/L)	150-450	220.8	221.0	319.2	200.3	322.7
Neutrophil (%)	50-70	55.88	60.14	68.04	22.4	47.01
Lymphocyte (%)	20-44	28.04	29.39	23.0	69.47	41.39
Monocyte (%)	2-9	9.85	7.91	6.99	5.55	4.79
Eosinophil (%)	0-4	2.63	1.19	0.74	0.96	5.72
Basophil (%)	0-2	3.6	1.37	1.23	1.62	1.09
Neutrophil (abs) (10^9/L)	2-7.5	8.38	8.5	10.11	2.93	6.13
Lymphocyte (abs) (10^9/L)	1.2-3.4	4.2	4.15	3.42	9.1	5.4
Monocyte (abs) (10^9/L)	0.00-0.90	1.48	1.12	1.04	0.73	0.63
Eosinophil (abs) (10^9/L)	0.00-0.60	0.39	0.17	0.11	0.13	0.75
Basophil (abs) (10^9/L)	0.00-0.20	0.54	0.19	0.18	0.21	0.14

[Table/Fig-1]: CBC during hospitalisation and after discharge of the patients.
WBC: White blood cell count; RBCs: Red blood cell count; HGB: Haemoglobin concentration; HCT: Haematocrit; MCV: Mean cell volume; MCH: Mean cell haemoglobin; MCHC: Mean cell haemoglobin concentration; PLTs: Platelet count; abs: absolute count

Investigation	Normal range	Day 1	Day 3	Day 4	Discharge day	After 1 month
Total protein (mg/dL)	6.4-8.2	6.8	6.3	7.2	6.6	6.3
Albumin (mg/dL)	3.4-5.0	3.1	3.0	3.4	4.2	3.3
Total bilirubin (mg/dL)	0.1-1.5	2.7	2.9	4.3	1.9	1.3
Direct bilirubin (mg/dL)	0.0-0.3	0.43	0.98	0.82	0.6	0.5
AST (IU/L)	7.0-40	1.649	514.0	213	110	56
ALT (IU/L)	10.0-60.0	537.0	343	194	32	34
Alkaline phosphatase (mg/dL)	30.0-85.0	97	82	86	76	57
Urea (mg/dL)	15-45	10.0	-------	17	22	18
Creatinine (mg/dL)	0.5-1.4	0.4	-------	0.3	0.5	0.5
Serum potassium (mmol/L)	3.3-5.5	4.41	------	4.19	4.17	3.9
Serum sodium (mmol/L)	135-145	133	------	128	139.0	122
C-reactive protein (mg/dL)	0.0-5.0	32.42	46.39	66.95	17.47	6.4
LDH (IU/L)	100-225.0	345	622	726	503	399
Ferritin (ng/mL)	20-250	934	------	2730.4	2593	957

[Table/Fig-2]: Laboratory investigation during hospitalisation and after discharge of the patient.
AST: Aspartate transaminase; ALT: Alanine transaminase; LDH: Lactate dehydrogenase level

On day 4 COVID-19 was confirmed and also there was a previous infection with COVID-19 (COVID IgG=3.981 AU/mL [NR:0-1 AU/mL] and COVID IgM=1.275 AU/mL [NR:0-1 AU/mL]). The coagulation study showed prolonged prothrombin time (22.9 seconds with INR 1.67), normal Activated Partial thromboplastin time, and normal thrombin time. He was given heparin therapy and received two bags of whole blood transfusion, by which his haemoglobin was increased from 2.45-8.18 g/dL. After a blood transfusion, joint pain, dyspnoea, and haemolysis were improved. The radiographic findings showed mild cardiomegaly due to chronic anaemia; and hepatomegaly. Chest radiography was normal. He was given 500 mg vitamin C, 30 mg zinc, and 500 mg paracetamol tablets.

He stopped Oxygen supply after day seven, but the fever was continuous until day 14. He was treated with 500 mg of paracetamol twice every six hours and 500 mg of azithromycin for three days. His laboratory exams were stable, a nasopharyngeal swab for SARS-CoV-2 on day 15 was negative, and he was discharged on day 16. His haemoglobin level was 7.25 g/dL, and oxygen saturation 96% without any symptoms during discharge. One month after hospitalisation, the patient was cleared of COVID-19. His physical examination and laboratory tests were normal according to his health situation as a Sickler patient, and his haemoglobin was improved.

The patient gave written informed consent to participate in the study and to publish his clinical data.

DISCUSSION

COVID-19 (caused by SARS-CoV-2) is a pandemic viral infection disease discovered in Wuhan, China, and rapidly spread worldwide [1]. Patients infected with COVID-19 suffer from various mild to severe clinical symptoms, including fever, cough, fatigue and gastrointestinal symptoms, pneumonia, acute respiratory syndrome, acute respiratory failures, sepsis, and septic shock [2]. Patients with chronic diseases such as cardiovascular diseases, diabetes, respiratory diseases, chronic kidney disease, and obesity were at high-risk of developing severe COVID-19 with a bad prognosis [3].

Patients with SCD, on the other hand, are considered to be particularly at risk of COVID-19 complications by the Thalassaemia International Federation (TIF) due to a number of factors, including COVID pneumonia which can lead to acute chest syndrome, which is a significant cause of morbidity and mortality in SCD patients due to the low immunity of those patients. Medical care for sickle cell anaemia and COVID-19 infection is a difficult task [4].

SCD is widely distributed in Africa. In Sudan, SCD has a high prevalence in Western Sudan. In the Messeryia tribe, one out of every 123 children is at risk of developing SCD [5].

The outbreak of COVID-19 infected many people, including SCD patients. Many studies on sickle cell patients with COVID-19 showed mild to moderate clinical course. In the USA, four sickle cell patients with COVID-19 showed a mild clinical course with no deaths [6]. In the UK, the authors reported only one death in 10 SCD patients infected with COVID-19. Five patients had mild symptoms without hospitalisation and the remaining recovered after a short period of hospitalisation [7]. The French national consortium found that the clinical outcome of COVID-19 was mild in patients with SCD, especially those younger than 45 years [8].

Although Sudan had a high prevalence of SCD and COVID-19 was widespread, the haematological and clinical outcome of those patients with COVID-19 is unknown. On the other hand, there was no obvious treatment guideline for sickle cell patients with COVID-19 in Sudan. The SCD patients are treated like any patient affected with COVID-19. They are managed with painkillers such as acetaminophen and morphine in addition to intravenous antibiotics (ceftriaxone), and oral azithromycin with vitamin support like Vitamin D, C, and zinc. This case report aimed to illustrate the clinical outcome in Sudanese SCD patients with COVID-19 to put a protocol for managing and treating this condition.

The patient's age was 20, the most affected age group, as shown in a previous study by Arlet JB et al., [8] and Ramachandran P et al., [9]. The studied patient was affected by COVID-19 two times. He presented with cough and pain the first time, with loss of smell and taste. He did required hospitalisation and recovered after isolating himself at home for two weeks.

Previous literature shows that patients may have reinfection by COVID-19 due to low lymphopenia [10,11]. The patient was infected for the second time, but unfortunately, no investigation was recorded after the first infection to confirm the previous issue. He presented with joint pain, fever, cough, and loss of sensation, and he needed oxygen supplementation for the second time. This case was in accordance with Al-Ansari RY et al., who reported that all patients presented with bone pain, cough, and fever in 80%, 40%, and 40% of cases, respectively [12].

The patient received no support in the ICU, similar to that reported by Hejlbronner C et al., [13] and Beerkens F et al., [14]. This indicates a milder clinical presentation of SCD with COVID-19 than previously predicted.

Arlet JB et al., reported that most sickle patients with COVID-19 infection required blood transfusion before or during admission to ICU [8]. The studied patient received two whole blood bags, indicating that the blood was diluted because of the patient's enormous intravenous fluid intake to lower his fever. The laboratory investigation of the patient had been improved with clinical enhancement; these findings were similar to Beerkens F et al., findings [14]. Despite the deviation of the haematological findings from the normal range (high white blood cells, low red blood cells, haemoglobin, and haematocrit) and also the biochemical lab tests (high total bilirubin, direct bilirubin, aspartate transaminase, C-reactive protein, and, lactate dehydrogenase level) the patient has been discharged from the hospital by the physician in charge. Because he was anaemic before as SCD patient, the Hb, RBCs, and HCT are usually low in these patients. Also, SCD patients develop haemolytic jaundice (High total Bilirubin, Direct Bilirubin) due to red cell destruction during the crisis. Also, because of infection, the inflammatory markers like C-reactive protein, LDH, and ferritin need time to get dropped down,

as mentioned by his physician. According to that, patient health was not affected by the discharge.

The patient gives good responses to medication with stable health status. The finding of this case study did not identify SCD as a risk factor for COVID-19, as shown by Abdulrahman A et al., [15]. The reported case study did not differ from previous cases regarding hospitalisation time and clinical outcome. The patient presented with an excellent response to medication and stable health status.

CONCLUSION(S)

In conclusion, the case report shows that SCD patients with COVID-19 have a favourable clinical outcome and a good prognosis. Sickle cell patients need special care, particularly among the pandemic COVID-19. Therefore, clinicians should pay attention to the SCD patients', and a treatment protocol should be established for good prognosis and better patient management. Further studies with a large sample size will be needed to understand COVID-19 in SCD patients better.

Acknowledgement

Many thanks to Dr. Ream Elzain Abdelgadir for her valuable comments and assistance.

REFERENCES

[1] Zheng J. SARS-CoV-2: An emerging coronavirus that causes a global threat. Int J Biol Sci. 2020;16(10):1678-85. Doi: https://doi.org/10.7150/ijbs.45053. PMID: 32226285.
[2] Pascarella G, Strumia A, Piliego C, Bruno F, Del Buono R, Costa F, et al. COVID-19 diagnosis and management: A comprehensive review. J Intern Med. 2020;288(2):192-206. Doi: https://doi.org/10.1111/joim.13091. PMID: 32348588.
[3] Guan WJ, Liang WH, Zhao Y. Comorbidity and its impact on 1590 patients with COVID-19 in China: A nationwide analysis. Eur. Respir. J. 2020;55(5):2000547. Doi: https://doi.org/10.1183/13993003.01227-2020. PMID:32341104.
[4] Thalassemia International Federation. The COVID-19 pandemic and hemoglobin disorders: A contribution of thalassemia international federation to its global Patients' community (version III, updated). Thalassemia International Federation. 2020.
[5] Sabahelzain MM, Hamamy H. The ethnic distribution of sickle cell disease in Sudan. Pan Afr Med J. 2014.18:13. Doi: 10.11604/pamj.2014.18.13.3280. PMID: 25360197.
[6] Hussain FA, Njoku FU, Saraf SL, Molokie RE, Gordeuk VR, Han J. COVID-19 infection in patients with sickle cell disease. Br J Haematol. 2020;189(5):851-52. Doi: https://doi.org/10.1111/bjh.16734. PMID: 32314798.
[7] Chakravorty S, Padmore-Payne G, Ike F, Tshibangu V, Graham C, Rees D, et al. COVID-19 in patients with sickle cell disease– A case series from a UK Tertiary Hospital. Haematologica. 2020;105(11):2691-93. Doi: https://doi.org/10.3324/haematol.2020.254250. PMID: 33131264.
[8] Arlet JB, de Luna G, Khimoud D, Odievre MH, de Montalembert M, Joseph L, et al. Prognosis of patients with sickle cell disease and COVID-19: A French experience. Lancet Haematol. 2020;7(9):e632-34. Erratum in: Lancet Haematol. 2020;7(9):e635. Doi: https://doi.org/10.1016/S2352-3026(20)30204-0.
[9] Ramachandran P, Perisetti A, Kathirvelu B, Gajendran M, Ghanta S, Onukogu I, et al. Low morbidity and mortality with COVID-19 in sickle cell disease: A single center experience. eJHaem. 2020;1:608-14. Doi: https://doi.org/10.1002/jha2.87. PMID: 35845018.
[10] Alberca RW, Yendo TM, Leuzzi Ramos YÁ, Fernandes IG, Oliveira LM, Teixeira FM, et al. Case Report: COVID-19 and chagas disease in two coinfected patients. Am J Trop Med Hyg. 2020;103(6):2353-56. Doi: https://doi.org/10.4269/ajtmh.20-1185. PMID: 33025877.
[11] Netea MG, Giamarellos-Bourboulis EJ, Dominguez-Andres J, Curtis N, van Crevel R, van de Veerdonk FL, et al. Trained immunity: A tool for reducing susceptibility to and the severity of SARS-CoV-2 infection. Cell. 2020;181:969-77. Doi: https://doi.org/10.1016/j.cell.2020.04.042. PMID: 32437659.
[12] Al-Ansari RY, Abdalla LM, Qomawi YA, Alromaih LJ, Bakkar MO, Shilash AS, et al. Coronavirus disease 2019 (COVID-19) in special groups: A single-center experience in sickle cell disease patients in Saudi Arabia. J Family Community Med. 2022;29(1):71-78. Doi: 10.4103/jfcm.jfcm_376_21. Epub 2022 Jan 19. PMID: 35197731.
[13] Heilbronner C, Berteloot L, Tremolieres P, Dupic L, de Saint Blanquat L, Lesage F, et al. Patients with sickle cell diseaseand suspected COVID-19 in a pediatric intensive care unit. Br J Haematol. 2020;190(1):e21-24. Doi: https://doi.org/10.1111/bjh.16802. PMID: 32420608.
[14] Beerkens F, John M, Puliafito B, Corbett V, Edwards C, Tremblay D. COVID-19 pneumonia as a cause of acute chest syndrome in an adult sickle cell patient. Am J Hematol. 2020;95(7):E154-E156. Doi: 10.1002/ajh.25809. Epub 2020 Apr 21. PMID: 32243621.
[15] Abdulrahman A, Wael M, AlAmmadi F, Almosawi Z, Alsherooqi R, Abduljalil M, et al. Is sickle cell disease a risk factor for severe COVID-19 outcomes in hospitalized patients? A multicenter national retrospective cohort study. eJHaem. 2021;2(2):167-74. Doi: https://doi.org/10.1002/jha2.170. PMID:33821258.

PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of Medical Laboratory Technology, Taibah University, Madina, Saudi Arabia.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Abdelrahim Mahmoud Muddathir,
Associate Professor, Department of Medical Laboratory Technology, Taibah University, Madina, Saudi Arabia.
E-mail: abdelrahimm@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Mar 25, 2022
- Manual Googling: Jul 21, 2022
- iThenticate Software: Aug 09, 2022 (5%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 16, 2022**
Date of Peer Review: **Apr 23, 2022**
Date of Acceptance: **Jul 25, 2022**
Date of Publishing: **Sep 01, 2022**