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Case Report

Changes in Routine Blood Tests in COVID-19: A Case at Janaki Medical College

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ABSTRACT

INTRODUCTION: COVID-19 is an infectious disease caused by the SARSCoV-2 virus, which has resulted in a worldwide media attention and public alarm. COVID-19 has a wide variety of clinical features, ranging from asymptomatic infection to mild to severe pneumonia. Different laboratory parameters get altered in COVID-19 patients. Therefore, biochemical investigations are important to assess the progression of the disease and categorize patients that may present a severe and/or fatal clinical condition. **CASE PRESENTATION**: The present case shows a 56-year-old male, without any significant medical history or comorbidities, suddenly developed fever and shortness of breath returning home attending a marriage ceremony at his village. He had the history of traveling but unaware about COVID-19 prone areas or with a direct contact of COVID-19 positive patients. The patient was primarily treated with medicines at home on telephonic consultation by physician but, didn't recover. During hospitalisation, his chest X-ray revealed ground-glass opacity in the right middle and lower zone of the lung. He was tested RT-PCR positive after X-ray. **CONCLUSIONS:** This case study concludes with lower levels of WBCs, Hb, lymphocytes, and eosinophils. The liver function tests were altered as well as renal impairment was common. The patient was encouraged to maintain home quarantine for at least 14 days after treatment. COVID-19 patient's prognosis may be improved by monitoring haematological and biochemical changes.

Keywords: COVID-19, creatinine, hemoglobin, liver function test, red blood cell

INTRODUCTION

The first outbreak of novel Coronavirus (2019-nCoV) was first reported in Wuhan, China, on 31 December 2019. The second wave of COVID-19 has overtaken the burden of morbidity and mortality around the world for its quick and efficient spreading nature [1]. The spectrum of this disease ranges from mild to severe, even life-threatening, with rapid progression to acute respiratory distress syndrome [2] and/or multiple organ failure [3].

South Asia appears to have become the epicentre of COVID-19's second wave, with the coronavirus infecting most of the countries including Nepal, India, Bangladesh, and Pakistan. The COVID-19 pandemic has plunged Nepal into a public health disaster. The second wave of COVID-19 had little effect in Nepal until the first week of March 2021. However, the situation in Nepal became increasingly concerning as two out of every five persons tested positive. The pandemic's second wave has not only affected the Kathmandu Valley, but also cities across the country, both in the hills and in the Terai [4]. In Nepal's Province 2, there had been sharp ups and significant increase in the number of COVID-19 positive cases [4]. Herein, the changes in routine blood parameters are reported at Janaki medical college teaching hospital in Province 2 throughout the process of diagnosis and treatment of a patient who was confirmed to have COVID-19.

CASE REPORT

The patient was a 56-year-old male from Saketnagar, Janakpurdham who worked as an Associate Professor in the Department of Sociology at Tribhuvan University, Nepal. The patient returned from his village on May 7, 2021, with a dry cough without sputum accompanied by mild fever, headache and fatigue with symptoms of upper respiratory tract infection. Following a telephonic consultation with a physician, the patient began

Table 1| Biochemical parameters of patients in hospital after admission in COVID Ward (19th May to 28th May, 2021)

Parameters	10th day	11th day	12th day	13th day	14th day	15th day	16th day	17th day	18th day	19th day
	19 May	20 May	21May	22 May	23 May	24 May	25 May	26 MAY	27 May	28 May
RBS (mg/dl)	123	132	140	165	210	221	185	190	194	180
Urea (mg/dl)	22	34	46	48	50	54	55	58	64	62
Creatinine (mg/dl)	0.7	0.9	1.1	1.2	1.1	1.0	1.1	1.2	1.3	1.3
Sodium (mEq/L)	137	138	137	138	141	140	142	140	142	140
Pottasium (mEq/L)	3.95	3.98	3.92	3.98	4.31	4.12	4.52	4.12	4.52	4.12
Bilirubin (Total) (mg/dl)	0.8	0.9	0.8	0.9	1.1	0.7	1.0	0.9	0.7	0.8
Bilirubin (Direct)(mg/dl)	0.2	0.3	0.3	0.2	0.6	0.2	0.4	0.3	0.2	0.2
SGPT(U/L)	79	82	89	92	110	121	126	129	124	128
SGOT(U/L)	54	57	59	54	86	57	52	63	56	59
Alkaline phosphatase(U/L)	175	180	184	192	198	225	229	231	228	224

Table 2|Hematological parameters of patients in hospital after admission in COVID Ward (19th May to 28th May, 2021)

Parameters	10th day	11th day	12th day	13th day	14th day	15th day	16th day	17th day	18th day	19th day
	19 May	20 May	21 May	22 May	23 May	24 May	25 May	26 May	27 May	28 May
Hb (gm %)	10	10.2	10.5	10	9	9.5	8	9	9.5	10
PCV (%)	28.3	29.2	30.2	28.2	25.4	26.2	22.8	25.6	26.2	28.4
RBC (million/mm3)	3.3	3.4	3.5	3.3	3	3.1	2.6	3	3.1	3.3
Platelets (/cu.mm)	1,35,000	1,37,000	1,39,000	1,41,000	1,42,000	1,43,000	1,64,000	1,68000	1,85,000	1,90,000
WBC (/cu.mm)	4200	4350	4400	4650	4750	5100	6480	6600	8200	8850
DLC Neutrophils (%)	82	84	83	85	86	87	85	82	78	63
Lymphocytes (%)	16	14	14	12	11	11	12	16	19	34
Eosinophils (%)	01	01	00	01	02	00	01	00	01	01
Monocytes (%)	01	01	02	02	01	02	01	02	02	02
Basophils (%)	00	00	01	00	00	00	01	00	00	00

taking medicines (Tab. Azithromycin 500mg O.D. and Tab. paracetamol 500 mg TID) for six days as adviced by the doctor. On May 13, 2021, the hematological paramates, (TLC) Total Leucocyte Count (6410/cumm), Neutrophill (80%), Lymphocyte (17%), Eosinophill (0%), Monocyte (3%), Basophil (0%), Immature Cells (0%), hemoglobin (11.3 gm/dl), Mean Cell Volume (MCV) as (89 fL), Mean Cell hemoglobin (MCH) as (28 pg), mean cell hemoglobin (MCHC) as (30%), Platelet Count (84000/cumm), RDW CV as (14%). Typhi DOT (Enteroscreen IgG/IgM), Dengue, Scrub typhus, and Brucella (IgG and IgM) were all found to be negative in the serological testing. C-reactive protein (CRP) was reported as 1.58 mg/dl before the confirmation of COVID-19 positive.

Although, the patient received symptomatic supportive treatment and medications, but did not recover. On the seventh day (May 14, 2021), his symptoms returned with a fever and dry coughing. On the phone, the consultant physician urged him to get the RT-PCR test, stay at home, and to start medications (Tab. Lucast 10 mg O.D; Tab. Asvit; Cap. Fortiplex O.D; Tab. prednisolone 4 mg B.D; Budecort inhaler BD). Furthermore, he was advised to measure and monitor his oxygen level with a Pulse Oximeter on room air. The saturation of oxygen in the blood (SpO2) was 92 %. On May 16, 2021, the patient began taking the medications and submitted his sample to the Provincial Public Health Laboratory-2 in Nepal for a Reverse Transcriptase-Polymerase Chain Reaction test (RT-PCR), which was positive for COVID-19 on May 17, 2021.

The patient feared with the positive report as well as news about deaths in second wave of pandemic corona. He started to take medicines and measuring SpO2 every hour as the doctor advised, but noted no improvement. At midnight on May 17, 2021, he suddenly felt rapid shortness of breath and measured his SpO2 which was 72% and fluctuated between 74%-82%. He was at risk, but anyhow managed to spend the night at home. However, on the tenth day, on May 18, 2021, at 4 a.m., he had

dyspnea and his SpO2 level was 74%, decreasing, unstable, and changing.

The patient came to an emergency department of Janaki Medical College with a non-diabetic, normotensive history, but had been taking thyroid medication (25 mg) for the previous three years, as well as eyedrops Combigan and Lumbigan from the previous seven years. He was concious, but his suffocation and breathlessness persisted. His blood pressure and SpO2 was measured. On the same day, May 18, 2021, the patient was admitted to the isolation unit at Janaki Medical College COVID Hospital, Ramdaiya, on oxygen support 2-4 L/min fiO2 0.28-036. Routine blood tests were performed after a chest X-ray indicated ground-glass opacity in the right middle and lower zone of the lung. Dexamethasone IV 6 mg TID, Enoxaparin IV 40 mg O.D, Dura Budecort inhaler BD, Pantop IV 40 mg BD, tab. Asvit 500 mg BD, Cap. Fortiplex OD, and Montelucast 10 mg OD were used to begin the treatment process. All routine blood tests were performed in the JMC clinical pathology laboratory, and were regularly monitored from the 10th to the 19th day after hospitalisation, as shown in Tables 1 and 2.

DISCUSSION

The COVID-19 pandemic is the biggest viral threat to humankind which has created significant public panic and distress. Routine blood tests refer to the examination of blood condition and disease by observing the quantity change and shape distribution in blood cells, including white blood cells (WBCs), white blood cell classification count, red blood cell count (RBC), hemoglobin (Hb) and platelets (PLTs). Routine blood test indicators are sensitive to many pathological changes, which may assist in diagnosis when the etiology of the disease is unknown. It has been established that COVID-19 infection is associated with patterns of blood test results among hospitalized patients has been established earlier. Blood tests, at particular levels, have been associated with a worse prognosis in COVID-19 patients [5] and have been shown to differentiate between those who are SARS-CoV-2 RT-PCR negative and positive [6]. Physicians taking care of COVID-19 patients have noted pronounced changes in their blood parameters. Recent studies showed that a few hematological parameters were clearly altered in COVID-19 patients [7,8].

Laboratory Investigations

In all clinical settings, blood glucose levels may serve as an instant and simple parameter for risk stratification and hierarchical management of COVID-19. Diabetes has been previously reported to affect the outcomes of COVID-19 cases [9]. However, the predictive values of blood glucose level in patients without diabetes are more concerning in clinical practice. Random blood sugar (RBS) levels were found normal on the tenth day of hospitalization. However, it gradually increased and peaked at 221 mg/dl on the 15th day, before dropping to 180 mg/dl on the 19th day. A rise in blood glucose levels could indicate relative hyperglycemia. Infection might trigger an inflammatory storm, which leads to insulin resistance. Stress and sympathetic activation may also be induced by infection. The SARS-CoV-2 virus may potentially affect the pancreas directly. All of these factors may increase the risk of hyperglycemia in COVID-19 patients [10,11]. Additionally, glucocorticoids cause a considerable alteration in glucose metabolism, which can lead to insulin resistance, hyperglycemia, and glycosuria. One of the first well-elucidated effects of this drug to be well understood was its role in increasing hepatic gluconeogenesis, which appears to be related to glucocorticoids' inhibitory effects on the conversion of pyruvic acid to acetyl-coenzyme A, resulting in pyruvic acid accumulation and glucose re-synthesis [12,13].

On the 19th day, the serum urea level had increased by 62 mg/dl, but the creatinine level was at borderline with value 1.3 mg/dl. Renal dysfunction was more pervasive and positively correlated in patients with COVID-19 individuals [14]. Although the mechanism of SARS-CoV-2-induced renal dysfunction is uncertain, increasing evidence suggests that SARS-CoV-2 plays a pathogenic role in COVID-19 patients by binding to the angiotension converting enzyme (ACE2) receptor [14, 15]. ACE2 has been found to be expressed in the renal tubular epithelium in several researches [16]. As a result, it's possible that SARS-CoV-2 damages kidney tissue directly through binding to the ACE2 receptor [17-19].

Electrolyte problems in patients, including sodium, potassium, chlorine, and calcium imbalances, have been confirmed in COVID-19 studies [20,21]. Hyponatremia is one of the most frequent electrolyte abnormalities, and it is associated with a higher risk of mortality in hospitalized patients [22].

From the 10th to the 19th day, serum sodium and potassium levels were within normal ranges, however there was a minor variance. The possibility is that patient's diarrhea and vomiting did not occur. The fever, which is a main symptom in COVID-19 patients, can cause dehydration, which should be treated by increasing rather than decreasing blood sodium concentrations [23, 24]. The syndrome of inappropriate antidiuretic hormone secretion (SIADH) has been documented in some persons with SARS-CoV-2 infection [25], causing fluid and electrolyte imbalances. Total bilirubin was 1.1 mg/dl and direct bilirubin was 0.6 mg/dl on the 14th day, although both significantly decreased until the 19th day of the hospital stay. From the 10th to the 19th day, serum levels of SGPT and SGOT were found to be increased. The highest SGPT value was 128 U/L on the 19th day, whereas the lowest SGOT value was 59 U/L on the 16th day.

Also, from the 10th to the 19th day, the ALP values were changed and increased, and they were substantially increased as 231U/L on the 18th day. Zhang et al. have already reported that liver impairment in COVID-19 patients could be drug related [26]. It can be assumed that liver function test alterations in patient was actually associated with the acute COVID-19 disease, rather than a pre-existing liver condition, especially considering the low prevalence of obesity and alcohol drinkers. Indeed, COVID-19-induced pneumonia certainly caused hypoxia and infammation [27] that may justify, at least partially, the biochemical alterations in liver function. Moreover, hepatotoxicity has also been linked to a number of drugs used to treat COVID-19 and its consequences, including hydroxychloroquine, antiviral agents, and antibiotics [28].

In hematological indices, the Hb dropped from 10th to 19th day reaching its lowest level of 8 gm/dl on 16th day. The RBC count peaked at 3.3 million/mm3 on the 10th day and dropped at 2.6 million/mm3 on the 16th day, before rising to 3.3 million/mm3 on the 19th day. This hemoglobin alteration would contribute to the oxygen deprived multi-faceted syndrome, which is actually generated by SARS-CoV-2 [29]. The combined effect of hemoglobinopathy and iron dysmetabolism may substantially impair erythrocyte's ability to transport oxygen, resulting in hypoxia and hyperferritinemia-related tissue changes. The progressively decreased hemoglobin level may lead to a sideroblastic-like anemia pattern, with myelodysplastic features, as per the acute need to replace dysfunctional erythrocytes [30,31]. Physiologically, anemic hypoxia induces general vasodilation, but also pulmonary vasoconstriction, with an increase of fibrin formation in lung microvasculature [32].

On the tenth day, the platelet count dropped to 1,35,000 (/cu.mm) and was found to be 1,90,000 (/cu.mm) on the nineteenth day. Platelets are an anti-inflammatory factor that increased as a result of medications, which could be one of the causes of platelet alterations. Furthermore, inflammation and immunological factors enhanced thrombopoietin (TPO), which promoted platelet formation [33, 34]. WBC counts were decreased dramatically 4200/cu.mm on the 10th day and increased with 8850/cu.mm on the 19th day, with neutrophils accounting for 82%, lymphocytes 16%, monocytes 1%, eosinophils 1%, and basophils 0%. On the 19th day, however, the readings for neutrophils, lymphocytes, monocytes, eosinophils, and basophils were 63%, 34%, 1%, 2%, and 0%, respectively. The differential count readings initially reduced, but after medication, from the 10th to the 19th day of hospitalization, a progressive rising trend was noted. At this stage, the virus prevailed, and the progressive decrease in WBCs was related to the direct invasion of the virus into hematopoietic cells or the aggravation of apoptosis and hematopoietic suppression caused by the infection of bone marrow stromal cells, which is basically consistent with the blood system performance after SARS virus infection [35]. Furthermore, following admission, monocytes and eosinophils were exceedingly low, which could imply that the patient's health was critical at first and then gradually improved. The patient was discharged from the hospital on May 30, when his health condition had stabilized, his fever and breathing difficulty had improved, and after two subsequent throat swab samples tested negative by PCR. He was advised to have a home quarantine

for the following 14 days and take proper care of himself.

CONCLUSIONS

WBCs, Hb, lymphocytes and eosinophils were decreased in COVID-19 patient initially. The values of liver function test and renal profile were altered. Dynamic hematological and biochemical changes could be helpful for the prognosis of COVID-19 patients. After confirmation of the RT-PCR negative, the patient was discharged. It is suggested clinicians should pay more attention to dynamic changes in the routine blood parameters, which may become a new basis for monitoring patient condition and evaluating treatment effects.

ADDITIONAL INFORMATION AND DECLARATIONS

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