Al-Azhar International Medical Journal

Volume 4 | Issue 4 Article 31

2023

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How to Cite This Article

Abdel-Razek, Fathy Ghamry; Alboraie, Mohamed Aly Abdelkhalek; and Elshaarawy, Ahmed Mohamed Hassan (2023) "Pattern of liver enzymes alteration in new corona virus disease(covid-19)," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 4, Article 31.
DOI: https://doi.org/10.58675/2682-339X.1731

ORIGINAL ARTICLE

Pattern of Liver Enzymes Alteration in New Corona Virus Disease (Covid-19)

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Abstract

Background: **Despite the fact that corona virus disease-19 (COVID-19) mostly damages the lower respiratory system and presents as pneumonia in humans, several people with COVID-19 also show variable degrees of liver impairment. There are numerous factors that lead to liver damage in the setting of COVID-19.**

Aim: **The aim of this study it was important to find out relation to liver function to explore the pattern of liver enzymes alteration in new corona virus disease and monitoring this alteration along the disease course.**

Patients and methods: **This prospective study included patients with Covid-19 infection. All procedures followed Al-Azhar University Ethics Committee regulations.**

Results: **There was significant decrease (improvement) in aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, direct bilirubin and gamma-glutamyltransferase (GGT) 2 weeks after admission and 2 weeks after discharge compared with their levels at admission ($P < 0.001$), while, no significant differences were found in ALP and serum albumin throughout follow-up time ($P > 0.05$).**

Conclusion: **Liver dysfunction was present in a high proportion of hospitalised COVID-19 patients.**

Keywords: COVID-19, Liver enzymes, New corona virus disease

1. Introduction

In Wuhan, a city in the central Chinese province of Hubei, the first cases of severe pneumonia and other respiratory tract infections were identified in December 2019, which was a crucial time. Information identifying the causal culprit, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), emerged and signalled the start of coronavirus illness diagnosis in 2019, in accordance with World Health Organization nomenclature (COVID-19).[1]

Corona virus disease-19 (COVID-19), which has been a pandemic since the start of 2020, has spread over the planet, disrupted human communities, and significantly destabilised the economy. More than 135.6 million SARS-CoV-2 cases had been reported worldwide as of April 12; more than 2.9 million people have died as a result of the disease's devastating course. The situation is still fluid, and daily updates to epidemiological data are made.[2]

Despite the fact that COVID-19 mostly damages the lower respiratory system and presents as pneumonia in humans, a small proportion of COVID-19 patients also exhibit varying degrees of liver damage.[3]

When it comes to COVID-19, a number of circumstances can result in liver damage.

Hepatocytes and cholangiocytes could be targets of this infection since SARS-CoV-2 enters cells via angiotensin converting enzyme 2 (ACE2).[4]

Cholangiocytes are required for maintaining hepatocyte homeostasis, therefore viral damage to them can impair hepatocyte cells. It is generally known that inflammatory stimuli can disrupt the hepatic milieu, causing gradual liver damage.[5] The second crucial component that will lead to liver

Accepted 3 November 2022.
Available online 22 January 2024

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https://doi.org/10.58675/2682-339X.1731

injury is activation of the innate immune system, either locally or systemically. Patients with severe immunological activation, also known as cytokine storm, have been found to have the highest levels of cytokines.[6] Third, drug-induced liver damage in patients receiving nonsteroidal anti-inflammatory drugs to treat fever, antibiotics to treat superinfections, or antiviral therapy is a worry. As the disease progressed, patients with COVID-19 experienced liver damage, aberrant alanine aminotransferase (ALT) and/or aspartate aminotransferase (AST) values, and modestly raised bilirubin levels.[6]

Compared with those with mild illness, patients with severe COVID-19 disease showed a significantly higher rate of liver damage.[7]

Understanding the pattern of changed liver enzymes in severe acute respiratory syndrome was the aim of the current investigation into coronavirus infection.

2. Patients and methods

Patients with Covid-19 infection were enrolled in this prospective study. All steps were taken in accordance with the ethics committee rules of Al-Azhar University. Before gathering any data or beginning any procedure, all patients' informed written consent was obtained.

2.1. Inclusion criteria

Age: patients greater than 18 years, sex: both sex will be included and patients confirmed to have Covid-19 by clinical criteria and SARS-CoV-2 RNA polymerase chain reaction results that are favourable (PCR).

2.2. Exclusion criteria

Patient less than 18 years, non Covid-19 patients and history of preexisting liver diseases.

2.3. Methods

All patients were subjected to the following procedures:

Full history including demographic characteristics will be noted. General physical and systemic examination will be done. Routine investigations including: Baseline PCR tests for SARS-CoV-2. Baseline liver function tests [ALT, AST, ALP, Total bilirubin, serum albumin, gamma-glutamyltransferase (GGT)]. Baseline complete blood count (CBC) [hemoglobin, red blood cells (RBCs) count, platelet count, white blood cells (WBCs) count, Lymphocyte-monocyte ratio and Neutrophil-lymphocyte ratio]. All investigations were repeated at discharge and two weeks after discharge.

2.4. Statistical analysis

Utilizing SPSS programme (Statistical Package for Social Sciences) software version 26.0, Microsoft Excel 2016 and MedCalC programme software version 19.1, the gathered data will be tabulated and statistically analysed. When two independent groups had parametric data, independent *t*-tests were used for inferential analyses; when two separate groups had nonparametric data, Mann Whitney *U* tests were used.

3. Results

This cross-sectional study was carried out on 60 patients with COVID virus infection disease. This study was carried in Al-Azhar University Hospital.

The study involved 60 patients in total, of whom 20 (33.3 %) were female and 40 (66.7 %) were male. The ratio of men to women was 2.0: 1. The age of the patients under study ranged from 20 to 87 years old, with a mean age of 57.72 (17.81) years. The age group greater than 60 years had the highest percentage of patients (48.1 %) while the age group 20–30 years had the lowest percentage. 41–50 years. Table 1.

26.7 % cases had DM and 36.7 % cases had hypertension. Two patients had CKD and two patients had ESRD on dialysis. Regarding cardiac diseases, 10 % had IHD, 3.3 % cases reported IHD with valvular heart disease, 3.3 % cases reported dextrocardia and 3.3 % cases reported ischemic cardiomyopathy and PAF. Table 2.

Table 1. Demographic characteristics in the studied patients.

	Studied patients ($N = 60$) N (%)
Sex	
Male	40 (66.7 %)
Female	20 (33.3 %)
Age (years)	
Mean ± SD	57.72 ± 17.81
Median	60.0
Range	20.0–87.0
Age groups	
20–30 years	5 (8.3 %)
31–40 years	9 (15.0 %)
41–50 years	5 (8.3 %)
51–60 years	12 (20.0 %)
>60 years	29 (48.3 %)

SD, standard deviation.

Table 2. Clinical history in the studied patients.

	Studied patients ($N = 60$) N (%)
DM	
No	44 (73.3 %)
Type I DM	6 (10.0 %)
Type II DM	10 (16.7 %)
HTN	
No	38 (63.3 %)
Yes	22 (36.7 %)
Renal	
No	56 (93.3 %)
CKD	2 (3.3 %)
ESRD on dialysis	2 (3.3 %)
Cardiac	
No	48 (80.0 %)
Dextrocardia	2 (3.3 %)
IHD	6 (10.0 %)
IHD with valvular heart disease	2 (3.3 %)
Ischemic cardiomyopathy and PAF	2 (3.3 %)
Respiratory	
No	50 (83.3 %)
Asthmatic	6 (10.0 %)
COPD	2 (3.3 %)
COPD exacerbation and type II RF	2 (3.3 %)
Others	
No	55 (91.7 %)
Accidents	1 (1.7 %)
BPH	1 (1.7 %)
Breast cancer	1 (1.7 %)
Lymphoma	2 (3.3 %)

No significant differences were found in Hemoglobin, R.B.Cs, Platelet Count, W.B.Cs count, Neutrophil/Lymphocyte (N/L) ratio and Lymphocyte/Monocyte (L/M) ratio throughout follow up time ($P > 0.05$). (Fig. 1).

The mean AST, ALT, total bilirubin and direct bilirubin was 48.33 ± 44.29 U/l, 59.87 ± 67.69 U/l, 0.80 ± 0.46 mg/dl, and 0.23 ± 0.17 mg/dl, respectively. The mean ALP, GGT, and Serum Albumin was 155.72 ± 86.02 U/l, 55.03 ± 41.44 U/l and 3.53 ± 0.73 g/dl, respectively. Table 3, Figs. 2 and 3.

There was significant decrease (improvement) in AST, ALT, total bilirubin, direct bilirubin and GGT 2 weeks after admission and 2 weeks after discharge compared with their levels at admission ($P < 0.001$), while, no significant differences were found in ALP and serum albumin throughout follow-up time ($P > 0.05$). Figs. 2 and 3.

The most frequent computed tomography (CT) finding was severe bilateral ground-glass opacitys (GGOs) that reported in 18 cases (30 %) followed by moderate bilateral GGOs in 17 cases (28.3 %). Extensive bilateral GGOs were found in two cases (3.3 %). Table 4.

Bright liver was reported in 2 (3.3 %) cases, Hepatosplenomegaly was reported in one (1.7 %) case, splenomegaly was found in one (1.7 %) case and prostatic enlargement in one (1.7 %) case. Table 5.

4. Discussion

The 60 patients with covid infection who participated in this prospective randomised research. In-depth research was done at Al-Azhar University.

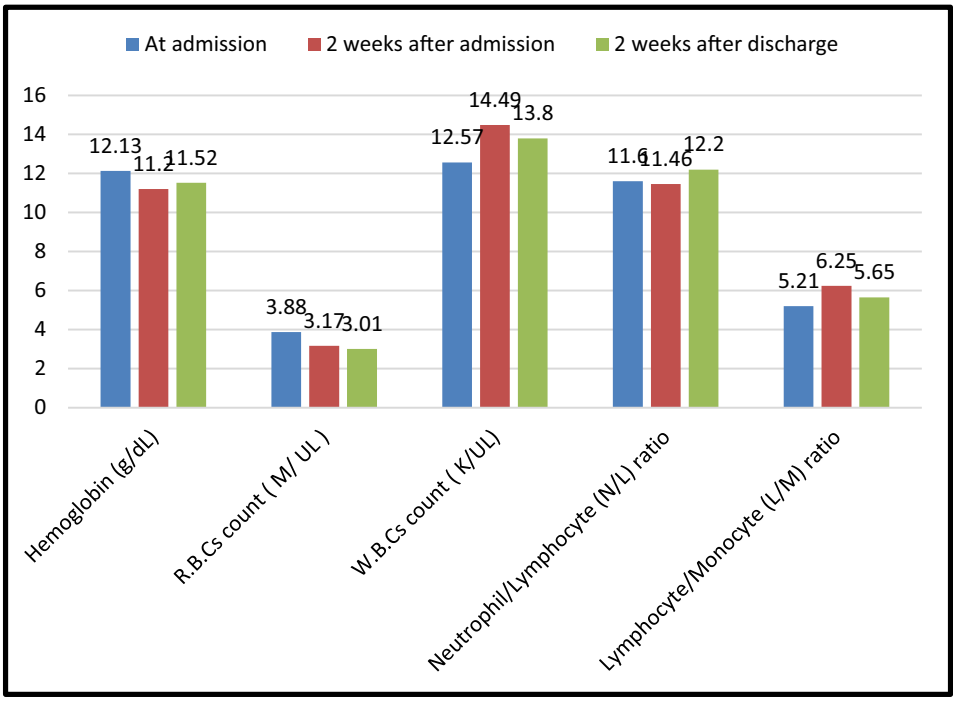

Fig. 1. CBC at admission, 2 weeks after admission and 2 weeks after discharge in the studied patients.

Table 3. Liver function tests in the studied patients.

	Studied cases (n = 60)			
	Mean ± SD	Median	Minimum	Maximum
ALT (U/l)	48.33 ± 44.29	34.50	6.00	227.00
AST (U/l)	59.87 ± 67.69	33.00	8.50	337.00
Total bilirubin (mg/dl)	0.80 ± 0.46	0.70	0.20	2.60
Direct bilirubin (mg/dl)	0.23 ± 0.17	0.20	0.07	0.80
ALP (U/l)	155.72 ± 86.02	132.00	40.00	432.00
GGT (U/l)	55.03 ± 41.44	43.00	11.00	191.00
Serum Albumin (g/dl)	3.53 ± 0.73	3.60	1.90	5.10

ALT, Alanine aminotransferase; AST, Aspartate aminotransferase.

The trial lasted somewhere between 6 and 12 months. Regarding demographic information, there were 60 total patients involved in the trial, of which 20 (33.3 %) were women and 40 (66.7 %) men. The ratio of men to women was 2.0 : 1. The age of the patients under study ranged from 20 to 87 years old, with a mean age of 57.72 (17.81) years.

The age groups with the most and least patients, respectively, were greater than 60 years (48.3 %), 20–30 years, and 41–50 years, respectively. Our results supported Wang and colleagues work,[8] which reported that the study population included 138 hospitalised patients with proven pneumonia brought on by the 2019 novel coronavirus (2019-nCoV) (NCIP). Males made up 75 (54.3 % of the population), and the median age was 56 years (IQR: 42–68; range: 22–92 years).

Peripheral eosinophils and neutrophils were dramatically altered in numerous haematological laboratory studies on lymphocytes in COVID-19 patients, leading to the suggestion that they may serve as potential indicators for both disease progression and treatment efficacy. Importantly, several research contend that a COVID-19 infection and a decline in hemoglobin (Hb) levels are related. This alleged connection to other types of pneumonia had already been documented Lippi.[9]

The current study showed that as regard as regard CBC; the mean hemoglobin level was 11.66 ± 1.46 mg/dl. The mean RBC, MCV, MCH, MCHC and RDW-CV were 4.18 ± 0.48, 82.68 ± 5.44, 30.84 ± 2.51, 34.06 ± 2.05 and 12.44 ± 0.99 respectively. The mean platelets, WBCs, neutrophils, lymphocytic count and neutrophil/lymphocyte ratio was 267.73 ± 61.94, 9.94 ± 1.83, 7648.57 ± 1460.02, 1356.50 ± 469.30 and 5.93 ± 1.35 respectively. Regarding CBC at admission, 2 weeks after admission and 2 weeks after discharge in the studied

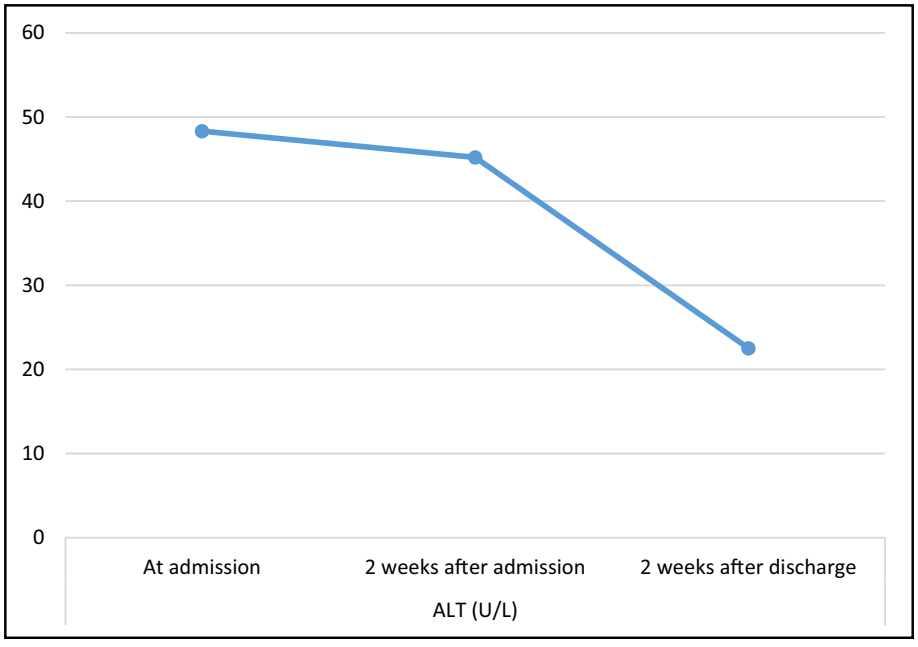

Fig. 2. ALT at admission, 2 weeks after admission and 2 weeks after discharge in the studied patients.

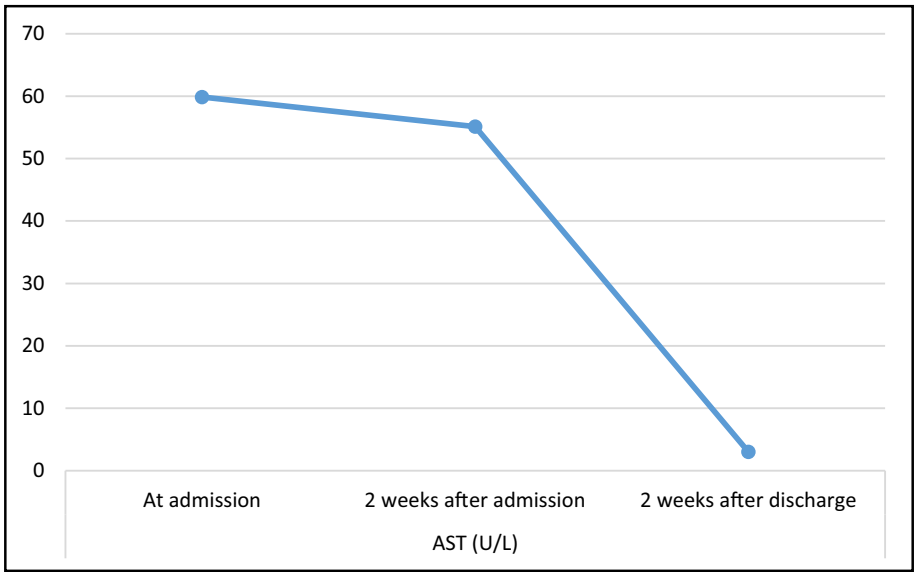

Fig. 3. AST at admission, 2 weeks after admission and 2 weeks after discharge in the studied patients.

patients; no significant differences were found in Hemoglobin, R.B.Cs, Platelet Count, W.B.Cs count, Lymphocyte/Monocyte (L/M) ratio and Neutrophil/Lymphocyte (N/L) ratio over the course of the follow-up period ($P > 0.05$). In the study of Gholizadeh and colleagues.[10] Nearly 59 years old on average, 164 (58.78 %) male and 115 (41.22 %) female patients made up the COVID-19 population.

The patients' red blood cell, platelet, and index values were all within acceptable limits. The patients' white blood cell counts were similarly within the usual range, corroborating our findings. According to Fan,[11] who also provided comparable statistics, the majority of COVID-19 patients had a normal CBC upon admission to the hospital (normal Hb, WBC, and platelet count). However, Usul and colleagues[12] showed that patients who tested positive for COVID-19 had considerably greater Hb levels than COVID-19-negative individuals. Variations in the research population's characteristics, such as the prevalence of underlying chronic illnesses and smoking, which may have a direct impact on the RBC profile, may be the cause of this disparity from our results. As the authors noted, those elements were not the exclusion criteria. In the study in our hands, as regard liver function tests; the mean AST, ALT, total bilirubin and direct bilirubin was 48.33 ± 44.29 U/l, 59.87 ± 67.69 U/l, 0.80 ± 0.46 mg/dl, and 0.23 ± 0.17 mg/dl, respectively. The mean ALP, GGT, and Serum Albumin were 155.72 ± 86.02 U/l, 55.03 ± 41.44 U/l, and 3.53 ± 0.73 g/dl, respectively. Regarding Liver function tests at admission, 2 weeks after both admission and discharge for the patients under study. There was significant decrease (improvement) in AST, ALT, total bilirubin, direct bilirubin and GGT 2 weeks after admission and 2 weeks after discharge compared with their levels at admission ($P < 0.001$), while, no significant differences were found in ALP and serum albumin throughout follow up time ($P > 0.05$).

Our results were in line with study of Ngiam and colleagues,[13] discovered that people with pneumonia had significantly higher levels of aspartate transaminase (64 141 vs 35 23 U/l, P 0.001) than people without. There were 102 individuals (18.4 %)

Table 4. Distribution of CT findings among the studied patients.

Parameters	Studied patients ($n = 60$) N (%)
CT findings	
Mild bilateral GGOs	8 (13.3 %)
Mild to moderate bilateral GGOs	15 (25.0 %)
Moderate bilateral GGOs	17 (28.3 %)
Severe bilateral GGOs	18 (30.0 %)
Extensive bilateral GGOs	2 (3.3 %)

Table 5. Distribution of Pelvi-abdominal U/S findings among the studied patients.

Parameters	Studied patients ($n = 60$) N (%)
Pelvi-abdominal U/S	
Normal	55 (91.7 %)
Bright liver	2 (3.3 %)
Hepatosplenomegaly	1 (1.7 %)
Prostatic enlargement	1 (1.7 %)
Splenomegaly	1 (1.7 %)

with high liver enzymes. They also had higher serum ferritin levels (240 274 vs. 165 198 ng/ml, $P = 0.002$), total white blood cell counts (6.95 2.29 vs. 6.39 2.19 × 109/l, $P = 0.021$), lactate dehydrogenase (632 vs. 632 degC, $P = 0.021$), and body temperatures (38.5 0.9 vs. 37.5 0.8 degC, $P = .011$), These patients needed more mechanical breathing (5.9 % vs. 2.2 %, $P = .046$) and intensive care (6.9 % vs. 2.7 %, $P = .036$). Wang et al. also found that 64 out of 156 (41.0 %) COVID-19 patients had elevated aminotransferases. In the aberrant and normal aminotransferase groups, the median aspartate aminotransferase levels were 45.5 U/l and 24 U/l, whereas the median alanine aminotransferase levels were 50 U/l and 19 U/l. A few lab tests, such as increased GGT, increased alveolar-arterial oxygen partial pressure difference, decreased albumin, and decreased $CD4^+$ T cells and B lymphocytes, were related with liver enzyme abnormalities and disease severity. Furthermore, Yadlapati et al.,[14] reported that among 200 patients, 55 % and 20 %, respectively, of them had AST and ALT elevation. In 28 % of cases, alkaline phosphatase increase was noted. There was a correlation between an increase in AST and the need for vasopressors (OR 1.034, 95 % CI 1.015–1.055; $P = 0.001$), intubation (OR 1.03, 95 % CI 1.01–1.05; $P = 0.002$), and inpatient death (OR 1.03, 95 % CI 1.01–1.05; $P = 0.002$). An AST/ALT ratio of 2 or above was observed in 34 % of patients, and it was linked to the requirement for intubation and vasopressors (OR 2.678, 95%CI 1.202–5.963; $P = 0.016$ and OR 3.352, 95%CI 1.495–7.514; $P = 0.003$, respectively).

The present study showed that the most frequent CT finding was severe bilateral GGOs that reported in 18 cases (30 %) followed by moderate bilateral GGOs in 17 cases (28.3 %). Extensive bilateral GGOs were found in two cases (3.3 %). Our results were supported by study of Huang and colleagues,[6] as they stated that all patients had abnormal chest CT scans found upon admission. 40 (98 %) of the 41 individuals showed bilateral involvement. Chest computed tomography (CT) images of patients who had been brought to Typical bilateral numerous lobular and subsegmental consolidation foci were visible in the ICU. Bilateral GGO and subsegmental areas of consolidation were visible on sample chest CT scans of non-ICU patients. Following the consolidation's disappearance, bilateral GGO was visible on chest CT images. Also, in the studies of Salehi and colleagues,[15] Bilateral, peripheral, and multilobar GGO regions as well as less significant patchy consolidation were the most often seen modifications. Our results showed that as regard Pelvis-abdominal US findings among the studied patients; bright liver was reported in 2 cases (3.3 %), Hepatosplenomegaly was reported in one case (1.7 %), and splenomegaly was found in one case (1.7 %) and prostatic enlargement in one case (1.7 %).

In the study of Bhayana and colleagues,[16] 27 % of studies found evidence of fatty liver in the US (10 of 37). At US, it was unintentionally discovered that one patient in the ICU had portal venous gas.

4.1. Conclusion

Liver dysfunction was present in a sizable portion of COVID-19 hospital patients.

Consent for publication

I verify that all authors have agreed to submit manuscript.

Availability of data and material

Available.

Funding

No fund

Conflicts of interest

They claim that the authors and the publication of this paper have no conflicts of interest.

References

1. Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol*. 2020;5(4):536–544. https://doi.org/10.1038/s41564-020-0695-z.
2. World Health Organization. *Confermed Cases of Covid-19 and Number of Deathes*. 2021.
3. Gao QY, Ying XC, Jing YF. Novel coronavirus infection and gastrointestinal tract. *J Dig Dis*. 2020;21:125–126.
4. Puli S, Muhammad B, Saqib W. Gastrointestinal symptoms and elevation in liver enzymes in COVID-19 infection: a systematic review and meta-analysis. *Cureus*. 2020;12:e9999.
5. Dickson I. Liver: cholangiocytes regenerate hepatocytes during severe liver injury. *Nat Rev Gastroenterol Hepatol*. 2017;14:503.
6. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395:497–506.
7. Guan W, Zheng-Yi N, Yu H, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382:1708–1720.
8. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *JAMA*. 2020;323:1061–1069.
9. Lippi C. Hemoglobin value may be decreased in patients with severe coronavirus disease 2019. *Hematol Transfus Cell Ther*. 2020;42:116–117.

10. Gholizadeh P, Safari R, Marofi P, et al. Alteration of liver biomarkers in patients with SARS-CoV-2 (COVID-19). *J Inflamm Res*. 2020;13:285.
11. Fan BE. Hematologic parameters in patients withCOVID-19 infection: a reply. *Am J Hematol*. 2020;95:8.
12. Usul IS, Bekgoz B, Sahin A. Role of hematological parameters in COVID-19 patients in the emergency room. *Biomarkers Med*. 2020;14:1207–1215.
13. Ngiam JN, Chew N, Tham SM, et al. Elevated liver enzymes in hospitalized patients with COVID-19 in Singapore. *Medicine*. 2021;100:30.
14. Yadlapati S, Lo KB, DeJoy R, et al. Prevailing patterns of liver enzymes in patients with COVID-19 infection and association with clinical outcomes. *Ann Gastroenterol*. 2021;34: 224–228.
15. Salehi S, Abedi A, Balakrishnan S, Gholamrezanezhad A. Coronavirus disease 2019 (COVID-19): a systematic review of imaging findings in 919 patients. *AJR Am J Roentgenol*. 2020; 215(1):87–93. https://doi.org/10.2214/AJR.20.23034.
16. Bhayana R, Som A, Li MD, et al. Abdominal imaging findings in COVID-19: preliminary observations. *Radiology*. 2020;297: E207–E215.