Biomedical Sciences
2023; 9(3): 60-63
http://www.sciencepublishinggroup.com/j/bs
doi: 10.11648/j.bs.20230903.12
ISSN: 2575-3924 (Print); ISSN: 2575-3932 (Online)

Impact of COVID-19 on Liver Function Tests Among Sudanese Patients: A Cross-Sectional Study of Khartoum State

Mogtaba Ahmed Mohammed[1, *], Alaa Abdalla Ibrahim[2], Ranya Adel Hamad[3], Jasim Mohamed Adam[2], Misson Shamsalfalah Ahmed[2], Musab Alsiddig Altayb[1], Mohammed Alhendi Ali[3], Amasi Abbas Idrees[3], Alaaeldeen Balal Ahmed[4, *]

[1]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Omdurman Islamic University, Omdurman, Sudan

[2]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, National University, Khartoum, Sudan

[3]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Elrazi University, Khartoum, Sudan

[4]Department of Microbiology and Immunology, Faculty of Medical Laboratory Sciences, Omdurman Islamic University, Omdurman, Sudan

Email address:

mogtaba1122@gmail.com (Mogtaba Ahmed Mohammed), alaabelal2009tlc@gmail.com (Alaaeldeen Balal Ahmed)

[*]Corresponding author

To cite this article:

Mogtaba Ahmed Mohammed, Alaa Abdalla Ibrahim, Ranya Adel Hamad, Jasim Mohamed Adam, Misson Shamsalfalah Ahmed, Musab Alsiddig Altayb, Mohammed Alhendi Ali, Amasi Abbas Idrees, Alaaeldeen Balal Ahmed. Impact of COVID-19 on Liver Function Tests Among Sudanese Patients: A Cross-Sectional Study of Khartoum State. *Biomedical Sciences*. Vol. 9, No. 3, 2023, pp. 60-63.
doi: 10.11648/j.bs.20230903.12

Received: April 6, 2023; **Accepted**: August 14, 2023; **Published**: August 28, 2023

Abstract: *Introduction*: Coronavirus disease 2019 (COVID-19) predominantly affects the pulmonary tract, causing mainly respiratory symptoms with some involvement of other organ systems. Liver injury has frequently been reported in COVID-19 patients. The clinical relevance of liver injury related to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection remains unclear, with a need for studies on the impact of liver function tests (LFTs) abnormalities at baseline. *Methods*: This cross-sectional study aimed to detect an association of LFTs with COVID-19 among Sudanese patients in Khartoum State, the Republic of Sudan's national capital city, from August to December 2021. A total of 90 patients with COVID-19 confirmed by real-time polymerase chain reaction (RT-PCR) were enrolled; their ages ranged from 20 to 80. 5 ml of venous blood samples were collected from each participant by standard venipuncture and placed into a heparin container for chemical analysis. The Mindray device was used to analyze the plasma, and the results were shown on a sizable color liquid crystal display (LCD). *Results*: The results showed that there was a significant difference (p. value ≤ 0.05) between levels of liver function tests according to the different categories of COVID-19 cases (mild, moderate, and severe). Also, the results indicated that there was an insignificant difference (p. value > 0.05) between levels of liver function tests according to gender. Moreover, the results found that there was no correlation between liver function parameters and age. *Conclusions*: The present study concluded that the levels of liver function tests were affected by the severity of COVID-19 infection.

Keywords: COVID-19, LFTs, Acute Respiratory Distress Syndrome

1. Introduction

SARS-CoV-2 causes COVID-19, which has rapidly evolved from an epidemic outbreak in Wuhan, China, into a pandemic infecting more than one million individuals all over the world, whereas billions of citizens are affected by measures of social distancing and the socioeconomic impact of the pandemic. SARS-CoV-2 invades host human cells by binding to the angiotensin-converting enzyme 2 (ACE2) receptor [1]. It has caused a total of 215 million confirmed cases, including 5.12 million deaths as of November 2021 [2].

Although it is well documented that COVID-19 is primarily manifested as a respiratory tract infection, emerging data indicate that it should be regarded as a systemic disease involving multiple systems, including the cardiovascular, respiratory, gastrointestinal, neurological, hematopoietic, and immune systems [1].

Genomic analysis revealed that SARS-CoV-2 is phylogenetically related to severe acute respiratory syndrome-like (SARS-like) bat viruses; therefore, bats could be the possible primary reservoir [3].

The major reason for the high mortality rate of COVID-19 infection is the severe inflammatory response against the virus. The systemic inflammatory response to severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) is a hallmark of coronavirus disease 2019 (COVID-19), and the majority of patients hospitalized for COVID-19 have abnormal inflammatory biomarkers [4]. Viral shedding can also occur in those who are asymptomatic, and these individuals may unknowingly spread the disease to others [2]. While the lungs are the primary target, this disease involves multiple other organs, including the cardiovascular system, kidneys, and liver [5]. Up to 11% of patients with COVID-19 have liver comorbidities, and 14% to 53% show elevated transaminase levels (alanine aminotransferase [ALT] and aspartate aminotransferase [AST]) during the progression of the illness. In addition, accumulating evidence suggests that there is a strong correlation between the severity of the viral infection and the degree of liver enzyme elevation, in which those with a mild case of the virus may have no abnormality or only slightly elevated aminotransferase levels, while those with more severe cases can present with higher elevations, furthermore, transient liver damage is also seen in mild cases of COVID-19, though the liver can return to normal with minimal treatment effort [6]. For the 4.5 million people in the US who have been diagnosed with one of the many forms of liver disease, COVID-19 infection can be particularly serious [7]. Furthermore patients with chronic liver disease are at high risk for encountering critical outcomes if they infected with COVID-19 [8]. Fortunately the laboratory tests particularly LFTs provides critical support for the proper clinical management of COVID-19 including assessing disease severity and progression as well as monitoring therapeutic intervention [9, 10].

2. Methods

From August to December 2021, 90 adult Sudanese patients with confirmed COVID-19 infection by real-time polymerase chain reaction (RT-PCR) were enrolled from the Universal Hospital, Jabra Emergency Hospital, and Trauma Hospital in Khartoum state, with ages ranging from 20 to 80. 5 ml of venous blood samples were collected from each participant by standard venipuncture and placed into a heparin container for chemical analysis. COVID-19 patients with muscle disorders or patients who refused to participate in study were excluded from this study. A structured questionnaire was developed based on patients' demographic data (age and gender), presence of comorbidity, disease severity, and symptoms. Informed consent was obtained from the patients who participated in the present study and with the agreement of general managers of quarantine hospitals in Khartoum state. Ethical committee approval has also been obtained from the National University and the Ministry of Health.

Plasma total protein (TP), albumin (ALB), total bilirubin (TB), direct bilirubin (DB), indirect bilirubin (IB), ALT, AST, and alkaline phosphatase (ALP) were measured by the Mindray device. All results were expressed as mean standard deviation (± SD). Statistical analysis was performed using SPSS version 21 (Statistical Package for the Social Sciences). The difference in mean values between groups was evaluated by a t-test. The Pearson correlation test was used to find the correlation between two variables. A P-value ≤ 0.05 was regarded as significant.

3. Results

This study included 90 Sudanese patients with COVID-19 infection confirmed by RT-PCR. The patients' ages was ranged from 20 to 80 years (Mean ± SD: 64.4 ± 15.2), the ages were subdivided into three groups: < 50 year, 50-70 year, and >70 year; 66.7% of patients were male and 33.3% were female, as shown in table 1. The patients with COVID-19 were divided according to severity of disease into three groups (mild, moderate, and severe), as shown in table 2. The results showed that there was a significant difference (*p.* value ≤ 0.05) between levels of liver function tests according to the different categories of COVID-19 cases (mild, moderate, and severe), as shown in table 3. In addition, the results showed that there was no significant difference (p. value > 0.05) in levels of liver function tests based on gender, as shown in table 4. Moreover, the results showed that there was no correlation between liver function tests and age, as shown in table 5.

Table 1. *Gender and age distribution of patients infected with COVID-19.*

		Frequency	Percent
Gender	Male	60	66.7
	Female	30	33.3
	Total	90	100.0
Age	< 50 year	18	20.0
	50- 70 year	42	46.7
	> 70 year	30	33.3
	Total	90	100.0

Table 2. *Classification of patients with COVID-19 according to the severity of infection.*

Disease severity	Frequency	Percent
Mild	18	20.0
Moderate	54	60.0
Severe	18	20.0
Total	90	100.0

Table 3. *Liver function tests according to the severity of COVID-19 infection.*

Parameter	Mild (n=18)	Moderate (n=54)	Severe (n=18)	*P. value*
TP (g/dl)	7.0 ± 0.5	6.9 ± 0.4	6.6 ± 0.7	0.041*
ALB (g/dl)	4.1 ± 0.2	3.9 ± 0.3	3.0 ± 0.2	0.000**
TB (mg/dl)	0.9 ± 0.2	0.7 ± 0.3	1.4 ± 0.4	0.010*
DB (mg/dl)	0.3 ± 0.1	0.2 ± 0.08	0.6 ± 0.2	0.003*
IB (mg/dl)	0.6 ± 0.1	0.5 ± 0.2	0.9 ± 0.2	0.004*
ALT (U/L)	25.2 ± 7.4	25.8 ± 9.3	42.8 ± 24.3	0.000**
AST (U/L)	23.8 ± 10.2	22.8 ± 8.2	42.3 ± 26.4	0.000**
ALP (U/L)	57.4 ± 15.1	62.2 ± 17.0	82.9 ± 49.6	0.008*

** Highly significant difference at 0.01
* Significant difference at ≤ 0.05

Table 4. *Liver function tests according to gender.*

Parameter	Gender		P. value
	Male (n=60)	Female (n=30)	
TP (g/dl)	6.9 ± 0.5	6.8 ± 0.5	0.453 ^{NS}
ALB (g/dl)	3.8 ± 0.5	3.8 ± 0.4	0.772 ^{NS}
TB (mg/dl)	0.9 ± 0.1	0.8 ± 0.2	0.838 ^{NS}
DB (mg/dl)	0.3 ± 0.05	0.3 ± 0.06	0.794 ^{NS}
IB (mg/dl)	0.6 ± 0.06	0.5 ± 0.07	0.231 ^{NS}
ALT (U/L)	29.9 ± 16.9	27.4 ± 9.7	0.460 ^{NS}
AST (U/L)	27.8 ± 18.3	25.0 ± 9.4	0.443 ^{NS}
ALP (U/L)	65.4 ± 30.9	65.3 ± 20.4	0.983 ^{NS}

NS: Not significantly different

Table 5. *Correlations of LFTs with the ages of COVD-19 patients.*

Parameter	Correlation (r)	*P*. value
TP (g/dl)	-0.106	0.322 ^{NC}
ALB (g/dl)	0.027	0.800 ^{NC}
TB (mg/dl)	0.137	0.198 ^{NC}
DB (mg/dl)	0.137	0.197 ^{NC}
IB (mg/dl)	0.105	0.327 ^{NC}
ALT (U/L)	0.002	0.985 ^{NC}
AST (U/L)	0.000	0.998 ^{NC}
ALP (U/L)	0.012	0.913 ^{NC}

NC: No correlation

4. Discussion

The present study was conducted in Khartoum State to investigate the LFTs among Sudanese patients with COVID-19 infection.

The present study indicated that there was a significant difference between levels of LFTs according to the different categories of COVID-19 infection (mild, moderate, and severe). This finding agrees with Wei *et al.*, 2021 [11], who found that there was a significant association between severity of COVID-19 and LFTs; it also agrees with Weber *et al*., 2021 [12], who found that LFTs were strongly associated with a severe course of the disease. Furthermore, Menon *et al.'s* meta-analysis of 2021 [13], found that elevated liver enzymes were significantly related to COVID-19 severity. Meanwhile Huang *et al*., 2020 [14], found that biochemical changes like decreased albumin, increased ALT, total bilirubin, lactate dehydrogenase (LDH), and procalcitonin levels were significant predictors of ICU admission. Moreover, Henry *et al*., 2020 [15], found that a significant elevation in liver enzymes, were reported in patients with the severe form of the disease.

In addition, the current study indicated that there was no correlation between LFTs and age; this finding was inconsistent with the results of Wei *et al.*, 2021 [11], and Weber *et al*., 2021 [12], who found that there was a significant association between age and LFTs; this conflict may be due to the small sample size in our study. Moreover, the result showed that there was an insignificant difference among levels of LFTs according to gender; this finding disagrees with Wei *et al*., 2021 [11], and Weber *et al*., 2021 [12], who found that the LFTs were strongly associated with gender.

5. Conclusion

The present study concluded that the levels of LFTs were affected by the severity of the COVID-19 infection as the levels of TB, DB, IB, ALT, AST and ALP were higher among severe COVID-19 cases, while the levels of TP and ALB were lower among severe cases. Based on the analysis of the current result we suggest that deranged LFTs may be useful as significant predictors of adverse clinical outcomes in COVID-19 disease.

Conflict of Interests

The authors have declared that no competing interests exist.

Acknowledgements

We thank all the patients who participated in this study and all of the staff from Universal Hospital and Jabra Emergency and Trauma Hospital in Khartoum state.

References

[1] Li Q. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *N Engl J Med*. 2020.

[2] World Health Organization. https://covid 19.who.int/. Accessed June 17, 2020.

[3] Rismanbaf A, Zarei S. Liver and kidney injuries in COVID-19 and their effects on drug therapy; a letter to editor. *Arch AcadEmerg Med*. 2020; 8 (1): e17.

[4] Pan D. The impact of ethnicity on clinical outcomes in COVID-19: A systematic review. *E Clinical Medicine*. 2020; 23: 100404.

[5] Smilowitz. C-reactive protein and clinical outcomes in patients with COVID-19. *European heart journal*. 2021; 42 (23); 2270-2279.

[6] Mantovani A. Coronavirus disease 2019 and prevalence of chronic liver disease: a meta-analysis. *Liver Int*. 2020; 40 (6): 1316–1320.

[7] American Liver Foundation, 2020. https://liverfoundation.org

[8] Zheng BJ. SARS-related virus predating SARS outbreak, Hong Kong. *Emerg Infect Dis.* 2021; 10 (2): 176.

[9] Lippi G, Plebani M. Laboratory abnormalities in patients with COVID-19 infection. *Clin Chem Lab Med* 2020; 58: 1131–4.

[10] Jayasri K, Pooja CH, Padmaja K, Prasad PE. Review on biochemical alterations in COVID-19 patients. *Int J Clin Biochem Res* 2020; 7 (3): 307-311.

[11] Wei Xu. Dynamic Changes in Liver Function Tests and Their Correlation with Illness Severity and Mortality in Patients with COVID-19: A Retrospective Cohort Study. 2021; 102-122, 140-147.

[12] Weber S, Hellmuth JC, Scherer. Liver function test abnormalities at hospital admission are associated with severe course of SARS-Cov-2 infection: a prospective cohort study. *Gut* 2021; 70: 1925-1932.

[13] Menon T, Sharma R, Earthineni G, Lftikhar H, Sondhi M, Shams S, Khurshid A, Khan H, Rathore S, Singh R. Association of Gastrointestinal System With Severity and Mortality of COVID-19: A systemic Review and Meta-Analysis. *Cureus*. 2021; 13 (12): e13317.

[14] Huang C, Wang Y, Li X. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lance*t. 2020; 395 (10223): 497–506.

[15] Henry BM, de Oliveira MHS, Benoit S, Plebani M, Lippi G. Hematologic, biochemical and immune biomarker abnormalities associated with severe illness and mortality in coronavirus disease 2019 (COVID-19): a meta-analysis. *Clin Chem Lab Med*. 2020; 58 (7): 1021–8.