

ASSESSMENT OF LIVER FUNCTION IMPAIRMENT AND ITS IMPACT ON SYMPTOMATIC COVID-19 INFECTED PATIENTS

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Abstract: *It is noted in literature that a significant number of COVID-19 infected patients had abnormal liver enzyme values as the disease progressed. Studies have shown a higher prevalence of hepatic impairment in patients with severe COVID-19. This study was designed to assess the variation of liver function test in COVID-19 patients and their relation to the severity of the illness. The secondary outcome of the study was the length of hospital stay and mortality assessment. This study was conducted at Bahira town international hospital Lahore from September 1, 2020, to September1, 2021. A total of 169 participants were included in the cross-sectional study those who meet the inclusion criteria. In this study we assessed the records of 169diagnosed cases of COVID-19 Infection on RT-PCR, and data were analyzed. They were further divided into two groups. First with abnormal liver function tests (LFT) and second Group consisted of normal LFTs. Liver function tests including total bilirubin, Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels, were recorded and liver dysfunction was labeled if any of the parameters were found to be elevated from the normal physiological range. A total of 236 COVID-19 individuals were examined during the one-year duration. Of those, 169 were found to be eligible, but 67 were disqualified because they had a history of hepatitis B and C or previous history of liver disease. The Abnormal liver function tests group included 81 participants whereas second group with normal LFTs had 88 participants. Patients with severe illnesses were more affected by liver malfunction than those with moderate illnesses. Patients with liver dysfunction required a longer stay in the hospital on average than patients with healthy livers did. Patients who had normal LFT at admission had a cure rate of 95.06%, while 4.94% of them passed away, whereas 18.18% of patients passed away in abnormal liver function test. Liver function derangement is frequent in individuals with severe COVID-19, and it can be brought on directly by a virus that damages the bile duct cells or indirectly by a cytokine storm and lead to increased mortality and length of hospital stay.*

Keywords: COVID-19, Liver function test, Mortality, Liver damage

Introduction

A viral respiratory infection known as the coronavirus disease 2019 (COVID-19) was originally discovered in Wuhan, Hubei Province, China. The SARS-CoV-2 coronavirus primarily involves the lungs also known respiratory system, but it has a capacity to induce multiorgan failure and death. Older and immune-suppressed people are more likely to proceed to severe COVID-19(Mohanty et al., 2020). It is a beta-coronavirus that is related to the

viruses that cause Middle East respiratory illness and severe acute respiratory syndrome. Over 95% of those infected have symptoms within 11.5 days. These viruses activate the mechanism that are involved in arterial or venous thrombosis and can lead to pulmonary embolism, stroke and myocardial infarction. An elevated serum ferritin level and hyperinflammation brought on by a cytokine storm have been related with severe COVID-19, which ultimately results in multiorgan failure (Jose and Manuel, 2020). In literature it has been revealed that the SARS-CoV-2 enters the cells through the

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angiotensin-converting enzyme 2 (ACE-2) receptor. The most recent study has demonstrated that the ACE receptors are not only present of type 11 alveolar epithelium but also present on the cells of bile duct (Rotondi et al., 2021). When Huang C, et al. examined the samples of liver biopsy from the COVID-19 patients, they discovered mild lobular inflammation and moderate microvascular steatosis (Huang et al., 2020). These findings imply that SARS-CoV2 may result in liver damage. According to a few case studies, 14-53% of COVID-19 individuals exhibited abnormal liver enzymes as the condition progressed. A larger percentage of patients with severe COVID-19 experienced hepatic impairment (Chen et al., 2020; Shi et al., 2020; Yang et al., 2020). The goal of this study was to look into the impairment in the liver function test in COVID-19 hospitalized patients and their relationships to illness severity, length of hospital stay (LOS), and patient prognosis.

Methodology

A total of 169 COVID-19 patients who were admitted to Bahria Town International Hospital Lahore, participated in the cross-sectional study. Both male and female gender between the age 18 to 80 were included in the study. Patients having no symptoms, pre-existing liver conditions like cirrhosis, those who have tested positive for the hepatitis B surface antigen or the hepatitis C virus, those who were using or had recently used hepatotoxic drugs and females who were expecting or feeding. The severity of disease was classified as mild, moderate and severe. If the individuals had minimal symptoms and no pneumonia found in the imaging, they were categorized as mild COVID-19 infection. Patients with moderate illness with COVID-19 infection had a fever, symptoms of the respiratory tract infection but no signs of respiratory distress, and imaging that revealed pneumonia. The severe COVID-19 infection is labelled if the patient at the time of admission had respiratory distress (Respiratory rate greater than the 30 breaths per minute), oxygen saturation levels on

pulse oximeter less than 93%, on radiological examination 50% lung involvement and arterial blood oxygen partial pressure/oxygen concentration levels less than 300mmhg. Data was collected from the medical record for further analysis. Any of the parameters related to the liver function test was categorized as abnormal if it was elevated from the normal levels. Ratios and frequencies were used to record categorical variables. The mean and standard deviation were recorded for the continuous variables. For continuous variables, the student's t-test, or Mann-Whitney test was used. The Chi-square test and Fisher's exact tests were applied to categorical variables. The difference between different parameters was deemed statistically significant if the P value was less than 0.05. The SSPSS software version 25 was used to analyze all of the data.

Results

A total of 169 COVID-19 individuals were examined between September 1, 2020, to September 1, 2021. Out of the 169 patients, 94 of them were men and 75 were women. 88 patients had the normal liver function test, whereas 81 of the 169 patients had liver dysfunction. In comparison to the female patients (37.33%) more male patients (47.87%) exhibited liver dysfunction (P value 0.01). The most common comorbid condition in our study population was diabetes mellitus followed by hypertension. Out of the 169 patients, 86 had a mild illness, 28 had a moderate illness, and 55 had a severe illness [Table 1][Figure 3]. Patients with severe disease exhibited higher liver impairment than patients with mild disease (67.27% vs. 35.71%, P value 0.002). When compared to individuals with normal liver function, patients with liver dysfunction had longer hospital stays on average (12 vs 7 days) [Figure 2]. 95.06% of the patients who had normal LFTs upon admission were cured, whereas 4.94% passed away. In the abnormal liver function group, 18.18% of patients did not survive. The death rate was significantly greater in the abnormal liver function group as compared to the normal LFT group (p= 0.006) [Figure 3]

Table 1 Demographics variables of participants

Variables	Total	Abnormal LFTS		Normal LFTS		P-value
	N	n	%	n	%	
Total Number of Patients	169	88	52.07%	81	47.93%	-
Males	94	45	47.87%	49	52.13%	
Females	75	28	37.33%	47	62.67%	
Co morbid conditions						
Diabetics	86	45	52.33	41	47.67	0.59
Hypertension	64	34	53.13	30	46.88	0.81
Cardiovascular diseases	39	21	53.85	18	46.15	0.62
Chronic obstructive pulmonary disease	18	8	44.44	10	55.56	0.51

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Renal impairment	7	4	57.14	3	42.86	0.49
Severity of Disease						
Mild	86	24	27.91%	62	72.09%	0.002
Moderate	28	10	35.71%	18	64.29%	
Severe	55	37	67.27%	18	32.73%	

Frequency of abnormal LFTs in different categories

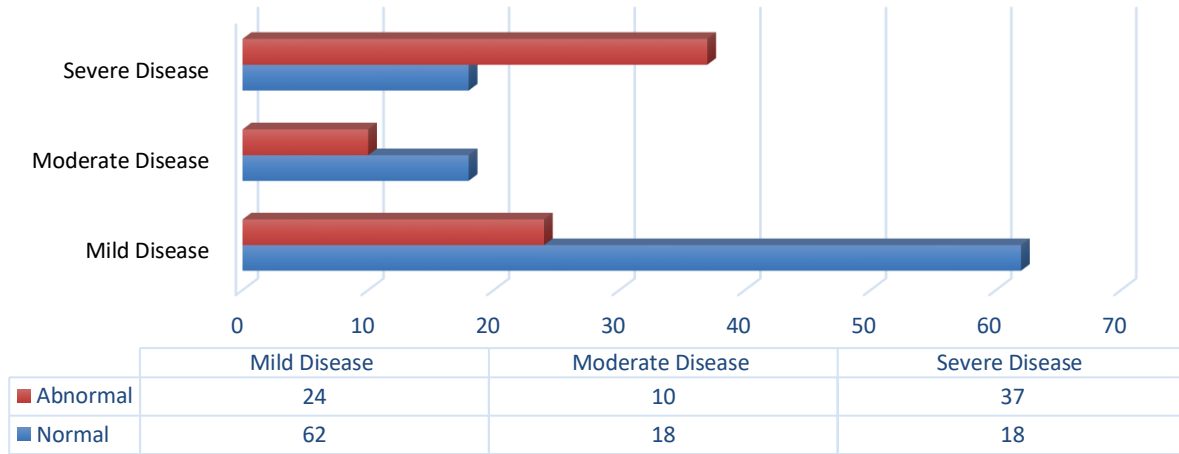


Figure 1 Distribution of participants with normal and deranged LFTS according to the severity of COVID-19 infection

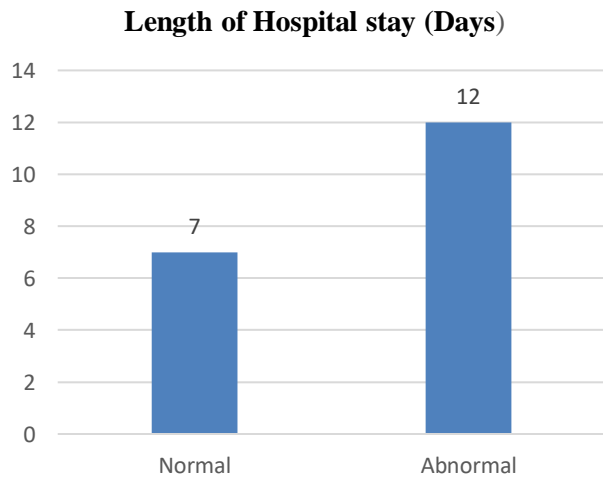


Figure 2 Comparison of length of Hospital stay between the groups

Number of deaths in each group

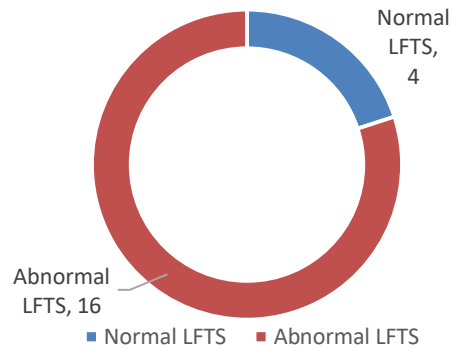


Figure 3 Comparison of mortality between the groups

Discussion

According to our study, liver dysfunction affected 52.07% of COVID-19 patients, and in severe cases, the percentage rose to 67.27%. More males than females were impacted. Numerous investigations have revealed that in COVID-19 patients, the male gender, comorbid conditions such as diabetes, hypertension, cardiovascular problems, and

secondary infections were associated with the poor outcome (Ciardullo et al., 2021; Nikpouraghdam et al., 2020; Zuin et al., 2021). Cai and his colleagues also reported that in severe COVID-19 infection the liver enzymes raised significantly and are linked to the poor prognosis. They also showed that when patients recovered, the liver parameters gradually returned to normal (Cai et al., 2020a). According to a recent comprehensive review and meta-analysis, increased AST and ALT were found in 33.3% and

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24.1%, respectively, of the COVID-19 cases (Wang et al., 2004). Other researchers have also discovered a connection between the severity of liver disease and the severity of COVID-19 (Guan et al., 2020; Zhang et al., 2020). None of the individuals in our research had liver enzyme levels that were more than four times the average. In a Shanghai study, deranged LFT was present at the time of hospitalization in 50.7% of all participants. The researcher found a higher percentage of patients presented with server symptoms in an abnormal LFT group as compared to the normal LFT group. Only a small percentage of patients were present in the Abnormal LFT group having milder symptoms (Alqahtani and Schattenberg, 2020). We also found a similar finding in our study where 72.09% of patients were presented with sever COVID-19 symptoms and had deranged function tests. Zhao and his colleagues included a total of 57 reviews in a systematic review and meta-analysis. The findings indicated that the incidence of liver dysfunction was 24.7% (95% CI, 23.4-26.4%) in patients with mild COVID-19 (Zhao et al., 2021). Compared to moderate patients, more severe patients had a higher frequency of liver dysfunction. Further investigation revealed that the levels of AST, ALT, total bilirubin, glutamyl transpeptidase (GGT), and alkaline phosphatase (ALP) rise, and the amount of albumin falls as the severity of COVID-19 grows (Cai et al., 2020b). Deranged transaminases cause a more severe form of the disease than other types, particularly in men. Additionally, hypoalbuminemia has been discovered to be a distinct sign of severe COVID-19 and associated with increased risk of mortality and poor prognosis (Gholizadeh et al., 2020). Similar result was noted by Radivojevic and his colleagues reported that 388 of the 849 individuals receiving COVID-19 therapy had abnormal liver enzymes. Additionally, they noticed that individuals with liver dysfunction tended to be older, have more comorbid conditions, and present with more severe symptoms. In COVID-19, mild liver impairment is frequently transient and reverts to normal without particular care (Radivojevic et al., 2022). However, these patients ought to be sent to a hepatologist when a serious liver injury occurs. Our study has same limitations such as retrospective study design and small number of sample size from a single hospital.

Conclusion

Patients with SARS-CoV-2 infection frequently experience liver damage, which may be brought on by cytokine storms or direct viral infection of the bile duct cells. Liver dysfunctions which are under common observation in sever COVID-19 infection led to increased mortality and burden of hospitals by lengthening the admission days. Thus, extra

consideration should be given to COVID-19 patients with deranged liver function tests to reduce mortality and to decrease the length of hospital stay.

Conflict of interest

Authors declare no conflict of interest

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