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Liver function test (SGPT) abnormality in 319 confirmed COVID-19 cases in Bangladesh

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Abstract

Background Deranged liver function abnormalities are well-recognized sequela of COVID-19 infection. Globally, there are studies dedicated to evaluate spectrum of liver injury by COVID-19. In this study, we have described the impact of COVID-19 on liver function tests in 319 confirmed COVID cases in Bangladesh. Our study aimed to determine the liver function alteration by COVID-19 in our population.

Methods This study included all adult inpatients (> 18 years old) with laboratory-confirmed (RT-PCR) COVID-19 from March to April, 2020 in a tertiary COVID-dedicated hospital. We assessed liver function test and categorized patients according to COVID severity. This was a single-center, retrospective, observational study.

Results Among 319 patients with COVID-19, 36% had normal and 64% had abnormal liver function test. Out of this, 18% had 1–2 times, 42% had 2–3 times, and 19% had > 3 times upper limit of normal SGPT during admission. Fifty-seven (18%) patients presented with mild illness, 83 (26%) with moderate, 124 (39%) patients with severe, and 54 (17%) with critical COVID-19 during admission. Significant correlation was found between severity of COVID-19 and raised SGPT level.

Conclusion More than half of patients presented during admission with abnormal liver function. COVID-19 has a significant impact on liver function derangement in this population.

Keywords Hepatitis, COVID-19, Liver function test, SGPT, ALT

Background

Since 2019 COVID-19 has claimed millions of lives until now. On 11th March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic [1]. It has only changed its name to Omicron in 2022 while the morbidity continued. The first COVID-19 case was detected in Bangladesh on March 8, 2020 [2]. Besides the involvement of the lungs, COVID-19 can involve the liver as well.

COVID-19 pathophysiology, disease progression, and optimal treatment are still under evaluation. Hepatic enzyme derangement is recognized as the most frequent extra-pulmonary manifestation of COVID-19 [3]. It is postulated that liver impairment may be due to the direct cytotoxic injury to hepatocyte by virus or indirectly by hypoxia, hepatotoxic drug, or severe inflammatory response [4]. Also, generalized inflammation and cytokine storm can cause multi-organ dysfunction including hepatic involvement [5, 6].

Recent studies suggest that more than half of patients with COVID-19 have liver injury [3, 7]. Elevated SGPT was reported ranging from 14 to 53% [8]. In Bangladesh, there are few studies to see the clinical profile of COVID cases [9, 10] and the relationship of COVID-19 hospital duration on liver enzymes [11]. The aim of this study was to see the spectrum of liver function tests and their

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relationship with the severity of COVID-19 patients in our population.

Methods

In this retrospective, single-center, observational study, we collected data from patients with COVID-19 who were admitted between March to April 2020. Demographic and clinical data were collected from hospital records onto a pre-defined spreadsheet. Diagnosis of COVID was based on clinical features (flu-like presentation, hypoxia, tachypnea, radiological findings) and RT-PCR test positive for COVID-19. COVID cases were clinically classified as mild, moderate, severe, and critical as defined in the Bangladesh national guideline on clinical management of COVID-19, version 8 [12].

Among the spectrum of liver function tests, we have picked SGPT only to assess liver injury to be focused. A patient was considered as having liver injury when alanine aminotransferase (ALT) or Serum glutamic pyruvic transaminase (SGPT) was more than 40 mU/ml.

Exclusion criteria

1. Patient with known chronic liver disease/preexisting liver disease
2. Patient taking alcohol
3. Patient on hepatotoxic drugs
4. Pregnancy

Results

Sixty-three (63%) percent of the study population was male and the mean age was 43 years. Among 319 patients with COVID-19, 64% had abnormal liver function test. The presenting symptoms of the study population were fever (88%), cough (67%), sore throat (27%), severe weakness (31%), breathing difficulties (17%), gastrointestinal symptoms (14%), and anosmia (7%) (Fig. 1). Regarding comorbidities, 13% of the study population were diabetic and 16% were hypertensive. Other less common comorbidities are shown in the diagram (Fig. 2).

Fifty-seven (18%) patients presented with mild illness, 83 (26%) with moderate, 124 (39%) patients with severe, and 54 (17%) with critical COVID-19 during admission (Fig. 3). Out of 64% raised LFT, 18% had 1–2 times, 42% had 2–3 times and 19% had > 3 times upper limit of normal SGPT during admission (Fig. 4). Significant correlation was found between severity of COVID-19 and raised SGPT level (Figs. 5 and 6). We set exclusion criteria as patient with known chronic liver disease/preexisting liver disease, patient taking alcohol, patient on hepatotoxic drugs, and pregnancy so that the preexisting contributing factors are of little significance.

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS version 23.0 for Windows) and Microsoft Excel 2016. All quantitative data such as age, hemodynamic, and laboratory parameters were estimated using mean ± SD. Categorical data were analyzed as numbers and percentages. Qualitative variables were described as proportions. For normally distributed data, means were compared using independent *t* test. Mann–Whitney *U* test was applied for statistical analysis of skewed continuous variables and ordered categorical variables. $\chi 2$ test was used to compare categorical data. *P* values < 0.05 were considered statistically significant.

Discussion

The present study was carried out on 319 COVID-19-positive patients admitted in a COVID-dedicated hospital. Several studies have described elevated liver panel in COVID-19 patients. Among them, alanine aminotransferase (ALT), aspartate aminotransferase (AST),

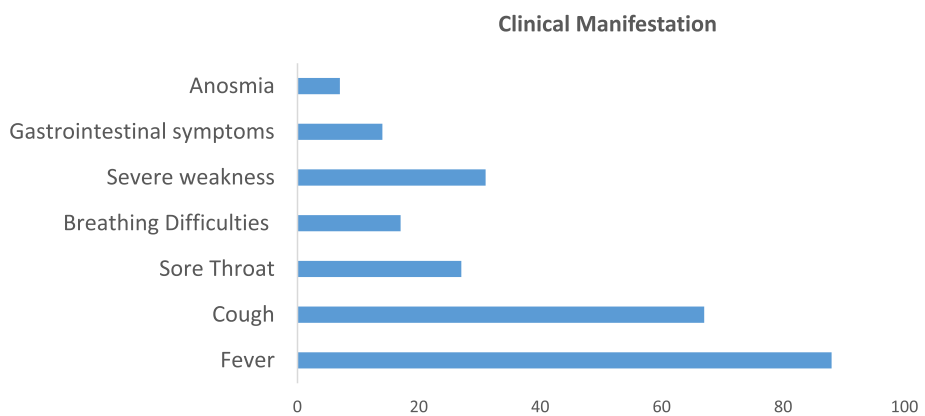

Fig. 1 The clinical presentation of the study population with fever (88%), cough (67%), sore throat (27%), severe weakness (31%), and breathing difficulties (17%)

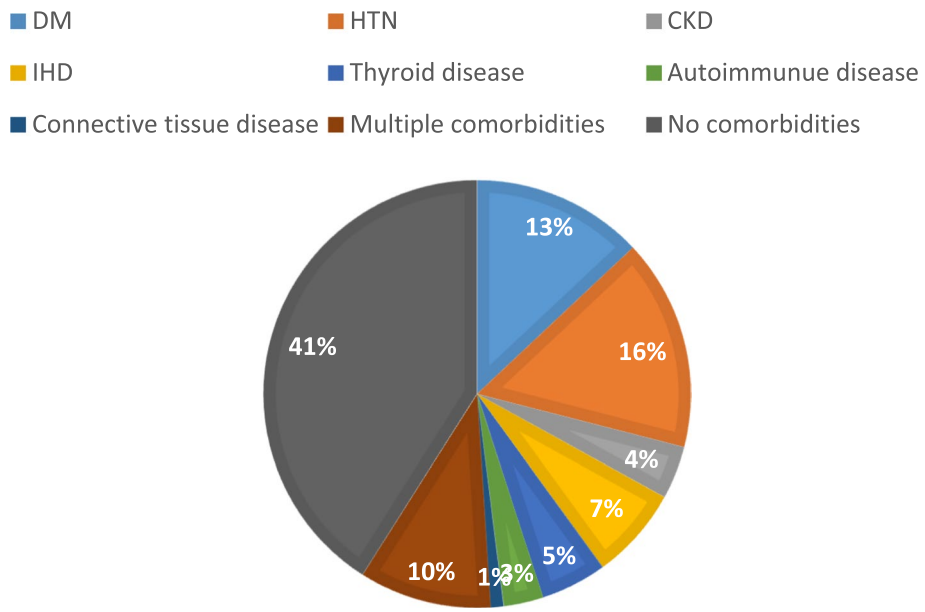

Fig. 2 Comorbidities of the study population—13% were diabetic and 16% were hypertensive and 10% of patients had multiple comorbidities

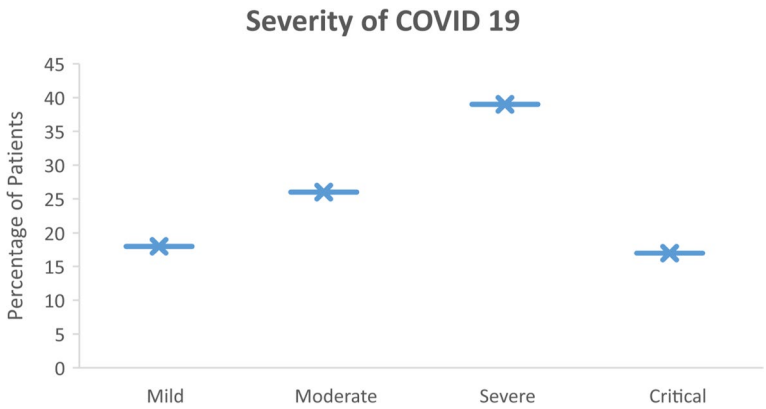

Fig. 3 Severity of COVID-19 of the study population showing the percentage of mild, moderate, severe, and critical COVID-19 cases

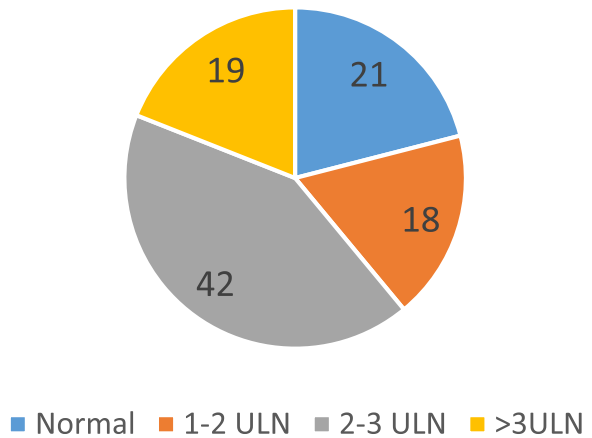

Fig. 4 Spectrum of SGPT derangement in the study population. ULN-upper limit of normal SGPT

and gamma-glutamyl transferase (GGT) are reported to be raised [13, 14]. We have chosen SGPT only among the liver function panel to be more specific and precise.

There is increasing evidence of direct, virally mediated liver injury caused by COVID-19 leading to enzyme elevation. But the causes of raised liver enzyme are multi-dimensional. Sepsis, ischemia, drug-induced liver injury, and host immune response are also contributing [15]. Even long-term liver injury by COVID-19 is reported [16]. We have taken liver function test sample on admission so that the effect of other contributing factors (sepsis, hospital drug treatment-antiviral, antibiotics, biologics) are minimal.

In our study, we found that more than half of our patients had an increased value of liver enzymes. A

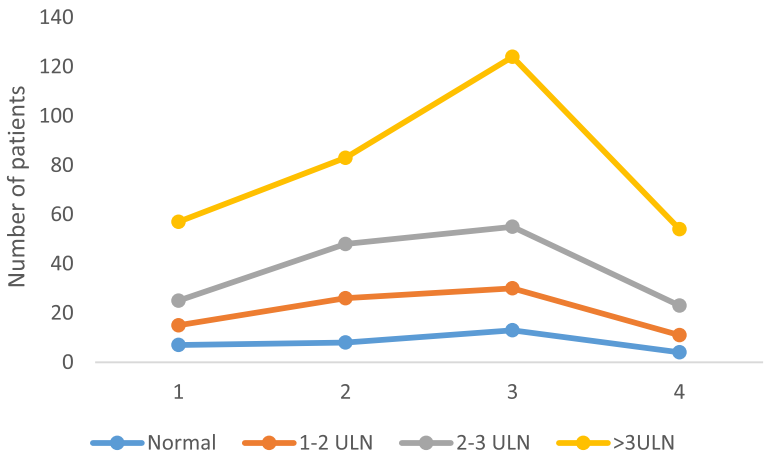

Fig. 5 The correlation between severity of COVID 19 and SGPT. 1 = mild, 2 = moderate, 3 = severe and 4 = critical cases. SGPT was more raised in severe and critical group of patients

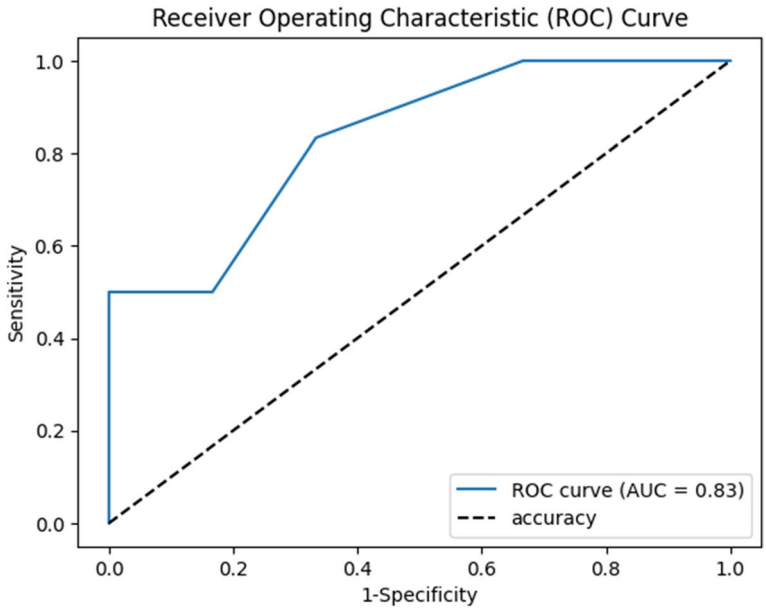

Fig. 6 Receiver operating characteristic (ROC) curve to detect severity of disease by SGPT. The AUC (area under curve) is 0.83 which is statistically significant

cohort study on 1059 patients in New York found that 62% presented with at least 1 elevated liver enzyme [17]. A high prevalence of altered liver function test was noticed in Italian patients with COVID-19 [18]. We got similar findings in all these studies. Hao et al. [19] found that 28.2% of patients with COVID-19 presented with elevated liver enzyme levels on admission which was less compared to our study.

In this study, SGPT was more raised in severe patients than in mild COVID patients. In a systematic review study, liver function test elevations were more frequent in those with severe disease [20]. In a retrospective USA study of 2273 patients with COVID-19, 45% had mild liver injury, which was defined as levels of alanine aminotransferase (ALT) above the upper limit of normal (ULN) and below 2 times ULN. Liver injury was moderate (ALT between 2 and 5 times ULN) in 21% of cases and severe (above 5 times ULN) in 6.4% of cases. Patients with severe liver injury had a higher rate of intensive care unit admission [21]. Our study came out to be supportive of those studies. Eighteen percent of our study population had 1–2 times, 42% had 2–3 times and 19% had > 3 times the upper limit of normal SGPT during admission. Out of 54 patients in the critical group 31 had SGPT > 3

times ULN. SGPT was more raised in severe and critical group of patients which was statistically significant. Significant correlation was found between COVID-19 severity and SGPT elevation.

The limitation of the study is that being an observational, retrospective, and single-center study, may not reflect the whole population. Also, the follow-up of liver function tests during hospital stay was not included in the study that preclude the spectrum of liver injury related to COVID-19 treatment or sepsis.

Conclusion

The mechanism of liver injury by COVID-19 is multifactorial. Further clinical studies are required for better insight into the mechanism of liver damage in severe to critical COVID-19 patients. This study highlighted the short-term effect of COVID on the liver. Also, more studies with long-term follow-up are needed to see long-term effect on the liver by COVID-19 in COVID long haulers.

Abbreviations

LFT	Liver function test
SGPT	Serum glutamic pyruvic transaminase
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
GGT	Gamma-glutamyl transferase
DM	Diabetes mellitus
HTN	Hypertension
IHD	Ischemic heart disease
CKD	Chronic kidney disease

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Authors' contributions

MY contributed to the research concept, manuscript writing, and data analysis while NKB did data collection, correction and AA contributed to the revision of the article. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was performed as a clinical audit using collected routine clinical data and is exempt from the need to take specified informed written consent from the patients. The study was approved by the local ethics committee of the hospital.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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