ORIGINAL ARTICLE

Clinical Features and Liver Function Tests in Non-ICU Hospitalized Patients with COVID-19 in University of Phayao Hospital

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Background: SARS-CoV-2 has had a variety of symptoms, from mild to acute respiratory distress syndrome or multiple organ failure.

Objective: To determine the epidemiological and clinical features of patients with COVID-19 who were admitted to non-intensive care unit (non-ICU) settings and to compare the results of liver function test (LFT) among different groups of non-ICU hospitalized patients with COVID-19.

Materials and Methods: The retrospective cross-sectional study was conducted at the University of Phayao Hospital, Thailand. Patients diagnosed with COVID-19 and admitted to non-ICU wards between November 2021 and March 2022 were included. Descriptive data were analyzed using mean ± standard deviation or median (interquartile range), Pearson's chi-square test, and analysis of variance (ANOVA).

Results: Three hundred ninety-nine patients were included in the present study, with the median age of 30.2 years. Fifty-five percent of the patients were female, 45.9% had normal BMI, and 89% had no comorbidities. Common symptoms were non-productive cough in 62.4%, sore throat in 52.9%, and fever in 37.3%. Twenty-one patients (5.3%) were classified as Group 1, 311 patients (77.9%) were in Group 2, and 67 patients (16.8%) were in Group 3, according to the Ministry of Public Health of Thailand guidelines. Thirty-five percent of patients had LFT abnormalities on admission. Nine patients (2.2%) had chest X-ray abnormalities, of which five were found at the time of admission, and most had normal LFTs. Four patients who developed pulmonary infiltration during their hospital stay also had abnormal LFT afterward. No patients were transferred to the ICU, required vasopressors, needed mechanical ventilation during hospitalization, or died.

Conclusion: The authors' study provides clinical and LFT data on hospitalized, non-ICU COVID-19 patients in a single university hospital. These results also represent epidemiological value and guidance for treatment in the current endemic area.

Keywords: COVID-19; Liver function test; Non-ICU hospitalized patients

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In December 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was discovered in Wuhan, China[1]. It was identified as the causative agent of pneumonia and spread rapidly worldwide. COVID-19 is a disease caused by SARS-CoV-2[2]. The target organ of SARS-CoV-2 is the respiratory system, and patients with COVID-19 presented with fever, sore throat, non-productive cough, and difficulty breathing[3]. The authors found that 81% of the patients had mild symptoms, 14% had serious condition, and 5% had critical illness[4]. Elderly patients or patients with comorbidities are at higher risk for severe disease[5-7]. Studies have shown that COVID-19 can cause multiple organ failures, including lung and liver[7,8]. Fifty percent of patients had liver function test (LFT) abnormalities[2,9]. Patients with liver injury were at risk of developing severe disease and were transferred to the intensive care unit (ICU), as well as having increased length of stay[2,5,7,10]. The authors aimed to determine the epidemiological, clinical features, and LFT of non-ICU hospitalized patients with COVID-19 at the University of Phayao Hospital.

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Materials and Methods

Study design

The present study was a retrospective cross-sectional research of a single-center investigation conducted at the University of Phayao Hospital in Thailand. The data collection was conducted by extracting information from medical records spanning between November 1, 2021 and March 31, 2022. The inclusion criteria were individuals who were older than 15 years and tested positive for SARS-CoV-2 by polymerase chain reaction (PCR) testing. These individuals were specifically admitted to non-ICUs at the University of Phayao Hospital in Thailand. The exclusion criteria were individuals with chronic hepatitis B or C infection, cancer, pregnancy, and incomplete medical history.

Study population

The data collection process involved the utilization of a patient admission form to gather demographic information pertaining to various factors such as gender, age, weight, body mass index (BMI), comorbidities, medication for comorbidities, initial clinical manifestations, alcohol intake, smoking status, time from symptom onset to hospitalization, previous treatments prior to hospitalization, vital signs, medical treatments administered during hospitalization, length of stay, complications experienced during hospitalization, and laboratory data obtained upon admission, including a complete blood count (CBC), LFT, blood urea nitrogen (BUN), and creatinine (Cr). Additionally, chest radiographs (CXR) were conducted on all patients at days 0, 2, and 5 during their hospitalization, with the interpretation of these CXR images performed by a qualified radiologist.

Classification of COVID-19: The clinical classifications of COVID-19 patients were divided into four groups according to treatment guidelines for COVID-19 infection issued by the Department of Medical Sciences, Ministry of Public Health of Thailand. These groups were Group 1, which consisted of asymptomatic COVID-19 patients, Group 2, which comprised of symptomatic COVID-19 patients without pneumonia and lacking risk factors for severe disease, Group 3, which consisted of asymptomatic COVID-19 patients with at least one risk factor for severe disease or mild pneumonia, and Group 4, which encompassed COVID-19 patients with pneumonia. Pneumonia in Group 4 was defined by the presence of pneumonia on CXR and an oxygen saturation level of 96% or lower at rest, or the progression of pulmonary infiltrates on a CXR.

Risk factors: The risk factors identified in the present study included advanced age of 60 years or older, chronic obstructive pulmonary disease, chronic lung disease, chronic kidney disease, uncontrolled diabetes, high body weight of greater than 90 kilograms or a BMI of 30 kilograms per square meter (kg/m^2), cirrhosis, immunocompromised status, history of cerebrovascular disease, congenital heart disease, and lymphocyte count below 1,000 cells per cubic millimeter. Mild pneumonia is characterized by the presence of pneumonia as indicated by a CXR, together with a resting oxygen saturation level over 96%[11].

Therapeutic strategies: The fundamental approach to treatment for all patients consisted of symptomatic treatment. Telemetry was employed to facilitate the ongoing monitoring of patients. The monitoring of vital signs and finger oxygen saturation was conducted. Patients in Group 2 to 4 were administered antiviral medication using Favipiravir. Patients with advanced pulmonary infiltration on chest radiographs or those who belonged to groups whose symptoms did not improve were administered corticosteroid.

The present study was reviewed and approved by the Human Ethical Committee of the University of Phayao (UP-HEC 1.1/003/66).

Statistical analysis

The data was analyzed using IBM SPSS Statistics, version 22.0 (IBM Corp., Armonk, NY, USA). The analysis of continuous variables involved the calculation of the mean ± standard deviation (SD) or the median and interquartile range (IQR). Categorical variables, on the other hand, were analyzed in terms of numbers and percentages. The statistical analysis employed for the examination of categorical variables in the present study was Pearson's chi-square test and analysis of variance (ANOVA). Statistical significance was attributed to p-values less than 0.05.

Results

A cumulative count of 411 COVID-19 patients not admitted to the ICU met the inclusion criteria for participation in the present study. Twelve individuals were removed from the study due to pregnancy, persistent viral hepatitis, or lack of comprehensive medical history upon admission. As a result, 399 patient records were retained for the analyses. The findings revealed 54.9% of the participants were

Table 1. Baseline characteristics of non-ICU hospitalized COVID-19

Variables	Total (n=399); n (%)	Normal LFT (n=258); n (%)	Abnormal LFT (n=141); n (%)	p-value
Age (years); mean±SD	30.2±14.73	27.62±13.09	34.42±16.49	<0.001
15 to 19	77 (19.3)	56 (21.7)	21 (14.9)	
20 to 30	194 (48.6)	141 (54.7)	53 (37.6)	
31 to 40	45 (11.3)	23 (8.9)	22 (15.6)	
41 to 50	31 (7.8)	15 (5.8)	16 (11.3)	
51 to 60	28 (7.0)	13 (5.0)	15 (10.6)	
>60	24 (6.0)	10 (3.9)	14 (9.9)	
Sex: female	219 (54.9)	159 (61.6)	60 (42.6)	<0.001
Body mass index				<0.001
<18.5	46 (11.5)	37 (14.3)	9 (6.4)	
18.5 to 22.9	183 (45.9)	129 (50)	54 (38.3)	
23.0 to 24.9	49 (12.3)	29 (11.2)	20 (14.2)	
25.0 to 29.9	89 (22.3)	51 (19.8)	38 (27.0)	
≥30.0	32 (8.0)	12 (4.7)	20 (14.2)	
Comorbidity: yes	43 (10.8)	20 (7.8)	23 (16.3)	0.008
Alcohol intake: yes	116 (29.1)	73 (62.7)	43 (30.5)	0.643
Smoking status: yes	36 (9.0)	24 (9.3)	12 (8.5)	0.792

LFT=liver function test; SD=standard deviation

female, 45.1% were male. The participants had a median age of 30 years with an age ranging from 20 to 30 years. Forty-five percent of the patients had BMI within the normal range of 18.5 to 22.9 kg/m². According to Table 1, the majority of patients, 89%, did not have any comorbidities. Additionally, 91% of the patients were non-smokers, and 71% were non-drinkers. Eighty-seven percent of the patients had body temperature of less than 37.3°C. The duration between the onset of early symptoms to hospital admission had a median value of two days. The prevailing symptoms observed in the present study were non-productive cough for 62.4%, sore throat for 52.9%, and fever for 37.3%. Gastrointestinal symptoms were quite rare. Out of the total sample size of 399 patients, 21 patients (5.3%) were categorized as Group 1, 311 patients (77.9%) were assigned to Group 2, and 67 patients (16.8%) were allocated to Group 3. The duration of the stay was nine days, with a range of eight to ten days, as seen in Table 2. Forty-three individuals (10.8%) presented with comorbidities. The prevalence of essential hypertension was found to be the highest among the concomitant conditions in 41.8% of the cases. This was followed by type 2 diabetes mellitus in 27.9%, and dyslipidemia in 18.6% of the population. Other additional comorbidities in the present study were quite small, as indicated in Table 3.

The researchers observed a significant decrease in the white blood cell count among patients in Group 2 compared to those in Group 1 and 3. The platelet and albumin levels of patients in Group 3 were found to be lower compared to those observed in Group 1 and 2. The patients in Group 3 had elevated levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), BUN, and creatinine in comparison to the patients in Group 1 and 2. The levels of lymphocytes, hemoglobin, and total bilirubin were similar across the three groups of patients, as indicated in Table 4.

The present study also indicated that 141 patients, or 35.3%, exhibited abnormal liver functions upon admission. Patients exhibited increased levels of AST by 26.1%, ALT by 15.8%, ALP by 7.8%, direct bilirubin by 1.8%, total bilirubin by 1%, and a decrease in albumin by 1%. The majority of the patients exhibited elevated levels of transaminases (AST and ALT) that exceeded one to two times the standard reference range. The concentrations of AST, ALT, and ALP in Group 3 exhibited significantly greater values compared to those in the other two groups ($p<0.05$). The patients in Group 3 exhibited significantly elevated levels of AST and ALT, exceeding thrice the values observed in the other two groups. There was no significant variation observed in the levels of total bilirubin, direct bilirubin, and albumin decrease among the three groups, as indicated in Table 5.

Out of the total sample size, 2.2% of patients (nine patients) had abnormality in their CXR

Table 2. Clinical feature of non-ICU hospitalized COVID-19

Variables	Total (n=399); n (%)	Normal LFT (n=258); n (%)	Abnormal LFT (n=141); n (%)	p-value
Temperature (°C)				0.806
<37.3	350 (87.7)	228 (88.4)	122 (87.1)	
37.3 to 38.0	40 (10.0)	24 (9.3)	16 (11.4)	
38.1 to 39.0	9 (2.3)	6 (2.3)	3 (1.4)	
Median 36.90, IQR 36.70 to 37.00				
Time from symptoms to hospitalization (days)				0.609
0	2 (0.5)	2 (0.8)	0 (0.0)	
1	136 (34.1)	85 (32.9	51 (36.2)	
2	104 (26.1)	66 (25.6)	38 (27.0)	
3	85 (21.3)	57 (22.1)	28 (19.9)	
4	44 (11.0)	32 (12.4)	12 (8.5)	
5	28 (7.0)	16 (6.2)	12 (8.5)	
Median 2, IQR 1 to 3				
Symptoms on admission				
Non-productive cough	249 (62.4)	166 (64.3)	83 (58.9)	0.280
Sore throat	211 (52.9)	136 (52.7)	75 (53.2)	0.927
Fever	149 (37.3)	98 (38.0)	51 (36.2)	0.720
Runny nose	136 (34.1)	83 (32.2)	53 (37.6)	0.275
Productive cough	64 (16.0)	45 (17.4)	19 (13.5)	0.302
Nasal congestion	39 (9.8)	24 (9.3)	15 (10.6)	0.668
Headache	39 (9.8)	27 (10.5)	12 (8.5)	0.530
Myalgia	24 (6.0)	14 (5.4)	10 (7.1)	0.504
Dyspnea	20 (5.0)	15 (5.8)	5 (3.5)	0.321
Loss of smell	9 (2.3)	6 (2.3)	3 (2.1)	0.899
Loss of taste	3 (0.8)	3 (1.2)	0 (0.0)	0.199
Vomiting	2 (0.5)	1 (0.4)	1 (0.7)	0.664
Group				<0.001
1	21 (5.3)	16 (6.2)	5 (3.5)	
2	311 (77.9)	215 (83.3)	96 (68.1)	
3	67 (16.8)	27 (10.5)	40 (28.4)	
Length of stay (days)				0.05
2	3 (0.8)	1 (0.4)	2 (1.4)	
6	2 (0.5)	1 (0.4)	1 (0.7)	
7	11 (2.8)	9 (3.5)	2 (1.4)	
8	175 (43.9)	126 (48.8)	49 (34.8)	
9	96 (24.1)	63 (24.4)	33 (23.4)	
10	88 (22.1)	46 (17.8)	42 (29.8)	
11	10 (2.5)	6 (2.3)	4 (2.8)	
12	6 (1.5)	3 (1.2)	3 (2.1)	
13	1 (0.3)	1 (0.4)	0 (0.0)	
14	4 (1.0)	1 (0.4)	3 (2.1)	
16	3 (0.8)	1 (0.4)	2 (1.4)	
Median 9, IQR 9 to 10				

LFT=liver function test; IQR=interquartile range

Group 1: Asymptomatic COVID-19; Group 2: Symptomatic COVID-19 without pneumonia and no risk factors for severe disease; Group 3: Asymptomatic COVID-19 with at least one of risk factors for severe disease or mild pneumonia

results. Among these cases, five were identified upon admission, while the majority of patients displayed normal liver function test results. Nevertheless, it is worth noting that four patients exhibited abnormal LFT upon admission, subsequently experienced pulmonary infiltration

Table 3. Associated conditions in the overall cohort of COVID-19

Comorbidities	Patients, n=43; n (%)
At least one comorbidity	
Essential hypertension	18 (41.8)
Type 2 diabetes mellitus	12 (27.9)
Dyslipidemia	8 (18.6)
Allergic rhinitis	4 (9.3)
Gout	3 (6.9)
Chronic obstructive pulmonary disease	2 (4.6)
Asthma	2 (4.6)
Major depressive disorder	2 (4.6)
Immunocompromised host	2 (4.6)
Hyperthyroidism	1 (2.3)
Hypothyroidism	1 (2.3)
Rheumatoid arthritis	1 (2.3)
Cerebrovascular disease	1 (2.3)
Systemic sclerosis	1 (2.3)
Iron deficiency anemia	1 (2.3)
G6PD deficiency	1 (2.3)
End stage renal disease	1 (2.3)
Chronic lung disease	1 (2.3)

while undergoing hospitalization, as indicated in Table 6. There were no patients being transferred to ICU, necessitated the use of vasopressors, relied on a high-flow nasal cannula, non-invasive ventilation, or mechanical ventilation throughout their hospital stay, or experienced mortality.

Discussion

The objective of the present study was to investigate the epidemiological and clinical characteristics, as well as LFT, in non-ICU hospitalized individuals with COVID-19 at the University of Phayao Hospital in Thailand. The majority of the patients in the present study exhibited a very youthful age, with a mean age of 30.2 years and SD of 14.7 years. In comparison, the previous research reported median ages ranging from 36 to 64 years, with a range of 12 to 18 years. Both cough and fever were frequent symptoms before hospitalization. Hypertension emerged as the most prevalent comorbidity. The present investigation replicated the methodologies employed in the previous studies conducted by Nemer et al., Al-Omari et al., Xie et al., Hong et al., Ponziani et al., and Lv et al.[12-17]. In contrast to the findings of Xie et al., Ponziani et al., and Lv et al., the present study observed that only 11% of patients exhibited comorbidities.

The researchers additionally discovered 141 patients, 35.3%, exhibited abnormal liver functions upon admission. The findings of the present study aligned with the previous research indicating that a significant proportion of patients diagnosed with COVID-19, ranging from 30% to 48%, had liver injury upon their admission[13,16,17]. The prevalence of the condition was higher among males compared to females according to the study of Xie et al. and Lv et al.[13,17]. The present study reported the findings of elevated levels of AST by 26.1%, ALT by 15.8%, ALP by 7.8%, direct bilirubin by 1.8%, and total bilirubin by 1%, as well as a drop in albumin levels by 1%. The patients had increased levels of AST, ALT, and bilirubin, respectively. Similarly, Xie et al. and Ponziani et al. had published findings that were

Table 4. Laboratory characteristics of COVID-19 patients at admission classified by groups

Parameters	Group 1 (n=21); mean±SD	Group 2 (n=311); mean±SD	Group 3 (n=67); mean±SD	p-value
WBCs (10^3 cell/cu.mm)	7.24±2.0	6.00±1.5	6.21±1.7	0.03
Lymphocytes (%)	30.14±10.1	33.81±11.1	30.76±9.4	0.051
Hemoglobin (g/dL)	14.03±1.5	13.88±1.7	13.76±1.8	0.789
Platelets (10^3 cell/cu.mm)	284.57±60.7	252.59±63.1	241.22±59.8	0.022
ALT (U/L)	23.52±17.0	23.53±22.9	36.37±36.0	0.001
AST (U/L)	35.14±29.2	28.97±17.8	39.85±28.0	<0.001
ALP(U/L)	66.10±20.5	68.52±20.7	81.36±29.6	<0.001
Albumin (g/dL)	4.33±0.2	4.32±0.3	4.20±0.3	0.044
Total bilirubin (mg/dL)	0.46±0.1	0.46±0.2	0.49±0.2	0.682
BUN (mg/dL)	10.67±2.6	10.41±3.0	12.29±5.6	0.001
Creatinine (mg/dL)	0.82±0.2	0.88±0.2	1.03±0.6	0.001

WBCs=white blood cells; ALT=alanine aminotransferase; AST=aspartate aminotransferase; ALP=alkaline phosphatase; BUN=blood urea nitrogen; SD=standard deviation

Group 1: Asymptomatic COVID-19, Group 2: Symptomatic COVID-19 without pneumonia and no risk factors for severe disease, Group 3: Asymptomatic COVID-19 with at least one of risk factors for severe disease or mild pneumonia

Table 5. Incidence of liver function test abnormalities according to severity of COVID-19

Liver function tests	Total (n=399); n (%)	Group 1 (n=21); n (%)	Group 2 (n=311); n (%)	Group 3 (n=67); n (%)	p-value
AST (U/L); median (IQR)	26 (20 to 34)	35.14 (20 to 41)	28.97 (20 to 31)	39.85 (26 to 44)	0.002
Normal	295 (73.9)	15 (71.4)	244 (78.5)	36 (53.7)	
1 to 2 ULN	88 (22.1)	5 (23.8)	56 (18.0)	27 (40.3)	
>2 to 3 ULN	8 (2.0)	0 (0.0)	7 (2.3)	1 (1.5)	
>3 ULN	8 (2.0)	1 (4.8)	4 (1.3)	3 (4.5)	
ALT (U/L); median (IQR)	17 (12 to 27)	23.52 (14 to 24)	23.62 (11 to 17)	36.75 (15 to 37)	0.021
Normal	336 (84.2)	18 (85.7)	270 (86.8)	48 (71.6)	
1-2 ULN	42 (10.5)	2 (9.5)	29 (9.3)	11 (16.4)	
>2-3 ULN	12 (3.0)	1 (4.8)	8 (2.6)	3 (4.5)	
>3ULN	9 (2.3)	0 (0.0)	4 (1.3)	5 (7.5)	
ALP (U/L); median (IQR)	68 (54 to 82)	66.10 (46 to 81)	68.52 (54 to 79)	81.36 (59 to 94)	<0.001
Abnormal	31 (7.8)	0 (0.0)	18 (5.8)	13 (1.4)	
Albumin (g/dL); median (IQR)	4.3 (4.1 to 4.5)	4.33 (4.2 to 4.5)	4.32 (4.2 to 4.5)	4.20 (4.0 to 4.4)	0.827
Abnormal	4 (1.0)	0 (0.0)	3 (1.0)	1 (1.5)	
Total bilirubin (mg/dL); median (IQR)	0.4 (0.3 to 0.6)	0.46 (0.35 to 0.55)	0.46 (0.30 to 0.60)	0.49 (0.3 to 0.6)	0.565
Abnormal	4 (1.0)	0 (0.0)	4 (1.3)	0 (0.0)	
Direct bilirubin (mg/dL); median (IQR)	0.1 (0.1 to 0.2)	0.12 (0.1 to 0.15)	0.15 (0.1 to 0.2)	0.17 (0.1 to 0.2)	0.606
Abnormal	7 (1.8)	0 (0.0)	5 (1.6)	2 (3.0)	

IQR=interquartile range; ALT=alanine aminotransferase; AST=aspartate aminotransferase; ALP=alkaline phosphatase

Group 1: Asymptomatic COVID-19, Group 2: Symptomatic COVID-19 without pneumonia and no risk factors for severe disease, Group 3: Asymptomatic COVID-19 with at least one of risk factors for severe disease or mild pneumonia

Table 6. Chest radiographs of COVID-19

Chest radiographs	Total (n=399); n (%)	Patient with normal LFT (n=258); n (%)	Patient with abnormal LFT (n=141); n (%)
Abnormal on admission	5 (1.2)	4 (1.5)	1 (0.7)
Abnormal on day 2 after admission	2 (0.5)	0 (0.0)	2 (1.4)
Abnormal on day 5 after admission	2 (0.5)	0 (0.0)	2 (1.4)

LFT=liver function test

consistent with each other, but differed from those reported by Lv et al. These studies had demonstrated that the increase of ALT occurred more frequently than that of AST[13,16,17]. The researchers moreover discovered that elevations of AST and ALT were more prevalent compared to rises in total bilirubin levels. The findings of the present study showed resemblance to the results reported by Xie et al., Lv et al., Weber et al., and Piano et al.[13,17-19]. The findings of the present study revealed the proportion of AST elevation was 26.1%. This aligns with the estimated range of AST elevation reported in the prior studies, which falls between 7% and 35%. The prevalence of elevated ALT levels was found to be 15.8%, which is within the predicted range of 19% to 31% reported in the prior investigations. The incidence of bilirubin elevation was found to be 1.8%, which is within the predicted range of 1.8% to 5.1% reported in prior investigations. The observed ALP elevation percentage was 7.8%, although earlier research findings indicated an expected ALP elevation of 4.6%[13,16,17,20]. The levels of AST and ALT exhibited minor elevations, ranging from one to two times the upper limit of normal, in non-ICU patients. However, in ICU patients, the elevations were more pronounced and of a bigger magnitude[13]. The study conducted by the authors also revealed that there was a greater disparity in the levels of AST and ALT upon admission among various clinical groups, particularly in Group 3, compared to the other groups. The outcome of the present study exhibited resemblance to the discoveries made by Pazgan-Simon et al., Lv et al., and Ponziani et al.[7,16,17,21]. In addition, the researchers discovered that a subset of patients, including 1% of the total population, exhibited blood albumin levels that fell below the established normal range. This observation is noteworthy as the majority of these patients displayed

minor symptoms, thereby distinguishing them from the rest of the cohort. Previous studies conducted by Huang et al., Cichoż-Lach et al., and Parohan et al. have demonstrated a higher prevalence of serum albumin reduction in patients with severe symptoms compared to those with mild symptoms[21-23]. Sivandzadeh et al. had shown that hypoalbuminemia observed in severe COVID-19 patients can be attributed to a combination of factors, including reduced albumin synthesis, heightened catabolic activity, and nutritional deficiencies[24]. The study findings revealed that the median levels of AST and ALT were 26 (20 to 34) U/L and 17 (12 to 27) U/L, respectively. While the median values of ALT and AST fell within the normal range, it is noteworthy that 26% and 15% of the patients exhibited increased levels of AST and ALT, respectively. The study conducted by Huang et al. reported median levels of AST and ALT to be 34.0 (24.0 to 40.5) U/L and 27.0 (19.5 to 40.0) U/L, respectively. Similarly, Xie et al. found median levels of AST and ALT to be 30 (23 to 50) U/L and 34 (18 to 67) U/L, respectively. Additionally, Hong et al. observed median levels of AST and ALT to be 28 (23 to 38) U/L and 24 (20 to 42) U/L, respectively[13,17,21].

On October 1, 2022, Thailand officially proclaimed the COVID-19 virus to be endemic disease. Patients diagnosed with COVID-19 who have modest symptoms are getting appropriate medical care in non-hospitalized settings. The primary focus of the authors' investigation was on mild symptoms in younger patients without chronic liver disease, which distinguishes it from the prior studies. The majority of the patients had normal BMI, and only a small proportion had comorbidities, engaged in alcohol consumption, or were smokers. Consequently, the present study findings mostly revolved around the occurrence of abnormal LFT in patients within this particular context. The majority of patients exhibited elevated levels of AST, ALT, ALP, and bilirubin, while a small number of patients presented with hypoalbuminemia. According to the authors' investigation, it is important for patients who exhibit an abnormal LFT upon admission to be cognizant of the high likelihood of developing pneumonia subsequent to contracting COVID-19. The researchers found four patients, 1%, with abnormal LFT upon admission that experienced pulmonary infiltration during their hospital stay. However, none of these patients required a transfer to ICU, mechanical ventilation, or succumbed to their condition. This observation aligns with the findings of Xie et al., who reported that none of their patients required invasive mechanical ventilation[13]. Piano et al. have demonstrated a significant association between abnormal LFT upon admission, namely elevated levels of AST, ALT, GGT, ALP, or bilirubin, and the likelihood of being transferred to the ICU or experiencing mortality[19]. Lv et al. conducted a study that demonstrated a correlation between abnormal LFT on admission, such as specifically AST, ALT, GGT, ALP, or bilirubin, and elevated risks of mortality, ICU admission, and the need for mechanical ventilation. Conversely, Ponziani et al. found that abnormal LFTs, specifically AST, ALT, or GGT, were associated with an increased risk of ICU admission but did not show a significant association with mortality[16,17]. Weber et al. demonstrated that the presence of hypoalbuminemia, in conjunction with abnormal levels of AST or GGT upon hospital admission, was identified as a risk factor for both ICU admission and mortality. Similarly, Wagner et al. found that hypoalbuminemia was associated with heightened mortality rates, as well as increased occurrences of hypotension, the need for vasopressors, intubation, and hemodialysis[18,25]. Furthermore, Hong et al. have demonstrated that a subset of patients, specifically 7.6%, who initially presented with mild symptoms without LFT abnormalities, experienced a progression to critical illness during their hospital stay. This finding aligns with the research conducted by Nemer et al., which reported that 14% of patients exhibited an increased requirement for oxygen, 14% required transfer to the ICU, and 6% succumbed to mortality. Additionally, Bhadauriya et al. observed that 3% of patients necessitated referral to other medical facilities, while 7.8% experienced mortality during their hospitalization[12,16,26]. In instances when individuals receive treatment in outpatient settings, it is imperative to closely monitor patients who exhibit abnormal LFT upon admission during the early stages of COVID-19 infection. Additionally, it is essential to do regular LFT follow-ups to monitor the progression of the disease.

There are limitations of the present study. Like most studies conducted in retrospect, the present study is limited to a single center, resulting in a small sample size. Additionally, a liver function test was conducted upon admission, with no subsequent monitoring during the hospital stay or post-discharge. Some patients included in the present study had insufficient documentation pertaining to their medical records, specifically in relation to the quantification of alcohol consumption. Consequently, a number

of patients were omitted from the study on account of insufficient documentation. While patients with chronic liver illness were excluded from the present study, it is important to note that overweight or obese patients may still have elevated levels of AST or ALT. Furthermore, the presence of fatty liver cannot be ruled out in obese patients who also have coexisting diseases such as type 2 diabetes mellitus. The authors cannot disregard the possibility of alcohol intake as a potential cause for the rise of AST or ALT, since it has been observed in patients who consume alcohol. The potential influence of medication treatment for comorbidities and hepatotoxic drug intake prior to the onset of COVID-19 has not been regarded as a causative factor for the elevation of AST or ALT levels.

Conclusion

In conclusion, the study revealed that a majority of the COVID-19 patients who were younger and did not require intensive care exhibited minor symptoms. Furthermore, it was observed that a sizable proportion of these patients did not have any underlying health conditions or chronic liver disease. Hence, it is crucial to acknowledge the necessity of closely monitoring patients. The aforementioned findings offer valuable insights for the therapeutic care of individuals with COVID-19 in the current endemic situation. Moreover, they have the potential to enhance early detection of patient situations, facilitate appropriate treatment strategies, and contribute to the reduction of mortality rates.

What is already known on this topic?

The observed incidence of abnormal LFT was seen to be high among patients diagnosed with COVID-19. Previous studies have demonstrated a correlation between abnormal LFT and negative outcomes.

What does this study add?

This study demonstrated that the detection of abnormal LFT upon admission did not correlate with severe outcomes during hospitalization. However, it is recommended that patients in the early phase of COVID-19 infection be continuously followed, and regular LFT follow-up should be conducted to monitor the progression of the disease.

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Conflicts of interest

The authors declare no conflict of interest.

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