

## STUDY OF PROGNOSTIC VALUE OF SERUM C-REACTIVE PROTEIN, LACTATE DEHYDROGENASE, AND GAMMA-GLUTAMYL TRANSFERASE LEVELS IN THE OUTCOME OF PATIENTS OF LIVER ABSCESS

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### Abstract

**Background:** To study the prognostic value of serum C-reactive protein, Lactate Dehydrogenase, and Gamma-Glutamyl Transferase levels in the outcome of patients with liver abscess with objectives to estimate levels of Serum CRP, LDH, and GGT in patients with liver abscess and to ascertain whether these enzymes can be used to correlate and evaluate the prognosis in patients of liver abscess. **Materials and Methods:** This observational prospective study was conducted in the Department of General Surgery, Government Medical College and STM Hospital, Haldwani, India, on 105 patients diagnosed with liver abscesses. Serum CRP, LDH, and GGT were measured twice, once at Admission and later before discharge. **Result:** At the time of Admission, CRP levels were above normal, and values increased in abscesses with a larger size indicative of severity. During treatment and resolution of liver abscesses, its value decreased. The LDH levels at the time of Admission were usually greater than expected, but a decrease in response to treatment and abscess removal was observed. At the time of Admission, GGT levels were high and gradually decreased with treatment and resolution of abscess. **Conclusion:** Higher Serum CRP, LDH, and GGT values correlate with the severity of liver abscess disease. These serum markers have prognostic significance.

## INTRODUCTION

Liver abscesses are a severe clinical problem that has a high death rate in both developed and developing countries. It can develop following severe liver injury arising from intra-abdominal infections or ascending infections from the GIT via the portal vein, often caused by bacterial or parasite infections that frequently lead to hospitalizations in low- and middle-income countries.<sup>[1]</sup> Liver abscesses can be of two main types: pyogenic (PLA) and amoebic (ALA), both having different pathogens but clinically presenting similarly. Patients typically experience right upper (RUQ) quadrant pain and fever. The distinction between PLA and ALA may be difficult to make accurately. It is possible to undertake various radiographical tests. Chest X-ray abnormalities, including an elevated right diaphragm and pleural effusion, may indicate this diagnosis. Abdominal ultrasonography (US), which can detect hyper or

hypo-echoic lesions with sporadic septation or debris, is the initial test of choice. The following step, which is more sensitive, is computed tomography (CT) with contrast. Edema and rim enlargement are highly distinctive. Ultrasonography and CT scans reveal a consistent lesion, confirming either the presence of a liver abscess or its absence. ALA is often seen as a single lesion in the right lobe, although it may occur as many lesions in the left lobe as in the right lobe. CT scanning is more sensitive (97%) than ultrasonography (85%) in detecting liver abscesses, but it may not always be accessible in low- and middle-income country settings.<sup>[2]</sup>

C-reactive protein (CRP) is a plasma protein synthesized by the liver in response to inflammation or tissue damage. CRP has both pro-inflammatory and anti-inflammatory properties. It recognizes and eliminates foreign pathogens and damaged cells.<sup>[3]</sup> CRP levels respond rapidly to the onset and resolution of inflammation, unlike the erythrocyte sedimentation rate, which is an indirect measure of

inflammation. However, CRP is a sensitive but nonspecific systemic marker of inflammation.<sup>[4]</sup>

Lactate Dehydrogenase, an enzyme classified as a protein, is vital in generating energy in the body. It is present in nearly all body tissues. Following tissue damage, LDH is released into the circulation or other body fluids.<sup>[5]</sup> The LDH enzyme's composition of subunits, including H and M subunits, varies between tissues. The variation arises from disparities in metabolic rates, energy needs, and tissue activities, as indicated by their LDHA: LDHB ratio. Heart muscle cells preferentially synthesize H subunits, while liver cells synthesize M subunits nearly exclusively. Skeletal muscle also synthesizes largely M subunits so that LDH-V is both a liver and skeletal muscle form of LDH. The LDH-I and LDH-V forms are most often used to indicate heart or liver pathology, respectively.<sup>[6]</sup>

Gamma-glutamyl Transpeptidase (GGT), also called gamma-glutamyl transferase, is a liver-specific enzyme. It is susceptible to liver injury and is typically abnormal in most individuals with liver illness, regardless of the cause.<sup>[7]</sup> However, the highest levels are usually observed in patients with cholestasis. The primary role of GGT is to facilitate the metabolism of glutathione and glutathionylated xenobiotics. High GGT levels enhance pro-oxidant activity, especially when iron or copper is present. Increased GGT levels can lead to damage in RBC membranes, leading to the release of harmful transition metals and triggering pro-oxidant responses.<sup>[8]</sup>

## MATERIALS AND METHODS

The present study was conducted in the Department of General Surgery, Government Medical College, and STM Hospital, Haldwani, after due permission from the Institute Ethical Committee for 18 months. It was a hospital-based observational prospective study done on 105 patients. The study was described to the participants, and their written consent was sought. Inclusion Criteria were all patients giving consent to be part of the study, all cases of liver abscess diagnosed clinically and/or ultrasonographically, all cases of bacterial and parasitic liver abscesses, and all cases in evolving, liquified, and ruptured stages with or without peritonitis. Exclusion Criteria were the patient's unwillingness to participate in the study and a history of liver abscess. The data for the study was collected by taking detailed history, careful clinical examination, and appropriate radiological and serological investigations. Patients were treated conservatively or with a percutaneous catheter, depending on the abscess volume. Those abscesses with <5cm were treated conservatively; failures to relieve symptoms within 3 to 4 days and with abscesses >5cm or >100cc, percutaneous catheter placement was done with a 12 Fr Pigtail catheter using USG. Their progress and outcome were recorded. Serum Levels of C- Reactive Protein

(CRP), Gamma Glutamyl Transferase (GGT), and Lactate Dehydrogenase (LDH) were measured in all patients with sonographic evidence of liver abscess at the time of admission and again before discharge.

Data was analyzed using parametric or non-parametric tests based on the distribution of the values obtained. Results were expressed as frequency, percentages, mean and standard deviation. A chi-square test was applied. A p-value less than 0.05 was considered significant.

## RESULTS

The study was conducted on 105 patients with liver abscesses. The age group 40-49 had the highest representation at 30.48% (32 patients), followed by 30-39 with 26.67% (28 patients), and 18-29 comprised 22.85% (24 patients). The mean age of the patients was 39.14 years, with a standard deviation of 10.98 years. Males represented the majority, with 87.61% (92 patients), whereas females accounted for 12.38% (13 patients). Alcoholism was the most common risk factor, affecting 33.34% of the patients. Diabetes was the second most prevalent, seen in 26.67% of patients. Abdominal pain was the most predominant symptom, affecting 93.34% (98 patients). Fever was also prevalent, reported by 64.76% (68 patients). Twenty-three patients (21.90%) had amoebic abscesses, and Eighty-two patients (78.10%) had pyogenic abscesses in etiology. The right lobe was most frequently involved, accounting for 70.48% (74 patients) of cases. 55 (52.38%) cases were treated with percutaneous catheter drainage. 35 (33.33%) cases were managed conservatively, while 13 (12.38%) cases underwent USG-guided aspiration, and 2 (1.90%) cases were managed by laparotomy surgery. CRP, LDH, and GGT values at admission were high and gradually decreased in response to treatment and resolution of abscess. [Table 1] shows that the CRP value at the time of admission was high ( $33.85 \pm 4.58$ ) and progressively decreased with treatment, and it became normal before discharge ( $4.02 \pm 2.04$ ). Here, the p-value (<0.001) is lower than the significance level of 0.05.

[Table 2] shows that the LDH value at admission was high ( $334 \pm 13$ ). Before discharge, the mean LDH level significantly decreased ( $173 \pm 8$ ). The p-value of <0.001 indicated a significant reduction in LDH levels from admission to discharge, suggesting a decreasing trend in the treatment administered during the hospitalization period and resolution of the abscess.

[Table 3] shows that the GGT value at admission was high ( $121.85 \pm 4.94$ ). Before discharge, the mean GGT level significantly decreased ( $20.60 \pm 3.13$ ). The p-value of <0.001 indicated a significant reduction in GGT levels from admission to discharge, reflecting a substantial improvement in liver function or reduction in liver stress due to the treatment provided during the hospital stay.

**Table 1: CRP Value Distribution.**

CRP (mg/dl)	No of Patients	Mean±SD	p-value
At Admission	105	33.85 ± 4.58	<0.001
Before Discharge	105	4.02 ± 2.04	

**Table 2: LDH Value Distribution**

LDH (U/L)	N	Mean±SD	p-value
At Admission	105	334 ± 13	<0.001
Before Discharge	105	173 ± 8	

**Table 3: GGT Value Distribution**

GGT (IU/L)	N	Mean±SD	p-value
At Admission	105	121.85±4.94	<0.001
Before Discharge	105	20.60±3.13	

## DISCUSSION

One hundred-five patients were included in our study, with the age of the study population ranging from 18 to 60 years, with the mean age of the patients being 39.14 years. The age group 40-49 has the highest representation at 30.48% (32 patients). Seeto R. K. et al,<sup>[9]</sup> and Tan J. A. et al,<sup>[10]</sup> have also found this age group susceptible to liver abscesses. Males comprised 87.61% (92 patients), while females comprised 12.38% (13 patients). There was a notable gender gap in this distribution, with almost seven times as many male patients as female patients in the sample. This concurs with the observation by Sharma N. et al,<sup>[11]</sup> Ahsan I. et al,<sup>[12]</sup> Goh K. L. et al,<sup>[13]</sup> and Tan J. A. et al.<sup>[10]</sup> Among the Risk factors, the most prevalent, impacting 33.34% (35 patients), was alcoholism. Sharma N. et al,<sup>[11]</sup> noted a history of alcohol consumption in 46.5% of patients, and Seeto R. K. et al,<sup>[9]</sup> reported it in 84% of patients in their study, respectively. The right lobe was involved in 70.48% (74 patients). This is per the findings observed by Khan R. A. et al,<sup>[14]</sup> Kebede A. et al,<sup>[15]</sup> Sharma N. et al,<sup>[11]</sup> and Qazi A. R. et al,<sup>[16]</sup> in their studies.

C-reactive protein is an acute inflammatory marker of hepatic origin that increases serum in response to inflammation. CRP synthesis increases within 4-6 hours after the onset of inflammation and doubles every eight hours. The CRP level reaches the peak value (around 150-350 mg/dl) within 36-50 h after infection. The high levels persist through the inflammation period. Therefore, when the disease is controlled, the CRP levels decrease quickly, and the decrease is strongly correlated with the relief from symptoms and the treatment duration. We observed that the CRP value remained high at admission and decreased with time duration. The average time taken for the CRP values to normalize in our study was 13±3 days.<sup>[17]</sup>

Serum LDH level is a marker of tissue necrosis and damage. Most patients had elevated levels of LDH in association with one or more elevated levels of liver enzymes either when they tested alone or with each other. Our study observed that the LDH value at the presentation time remained in the 300-350 IU/L range and did not show a consistent rise with

increasing size of liver abscess. However, it decreases with the resolution of the abscess. Thereby, it can be considered an indicator of response to treatment.

GGT is an enzyme primarily originating from the hepatobiliary system and significantly increasing in chronic liver diseases, including alcoholic liver disease. Our study observed that higher GGT levels with the growing volume of liver abscesses became standard with a resolution of abscesses. Still, GGT values remained high in alcoholic patients even after treatment. This is because the microsomal injury is more severe when the alcoholics have an abscess in the liver.

## CONCLUSION

CRP value at admission was generally high and higher in larger-size abscesses, indicating the severity of the disease. With treatment and resolution of liver abscess, its value decreases typically. In most cases, CRP level became standard at the end of 13±3 days. LDH value at admission was generally high but showed a decreasing pattern in response to treatment and resolution of the abscess. Therefore, decreasing LDH levels can be considered a good prognostic factor.<sup>[17]</sup>

GGT value at admission was high, and gradually, its level decreased with treatment and resolution of liver abscess. Therefore, a higher level of Serum GGT at the onset and after resolution is undoubtedly an excellent prognostic factor.

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