ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 11 | November - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY OF GAMMA GLUTAMYL TRANSFERASE IN CHRONIC HEPATITIS B PATIENTS AND ITS ASSOCIATION WITH THE SEVERITY OF HEPATIC FIBROSIS IN A TERTIARY CARE HOSPITAL OF NORTH EAST INDIA

Gastroenterology

Dr. Hrishikesh Sarma — DM Resident, Department of Cardiology, Gauhati Medical College and Hospital.

Dr. Sreemanta Madhab Baruah — Associate Professor, Department of Medicine, Assam Medical College and Hospital.

Dr. Akshay Saha* — Postgraduate Trainee, Department of Medicine, Assam Medical College and Hospital. *Corresponding Author

Dr. Prasanta Dihingia — Professor and Head of Department, Department of Medicine, Assam Medical College and Hospital.

ABSTRACT

Background: Chronic hepatitis B (CHB) is a major global public health challenge, particularly in resource-limited regions such as India[1]. Accurate staging of hepatic fibrosis is vital for guiding management decisions. Although liver biopsy remains the gold standard, its invasiveness limits use. Gamma-glutamyl transferase (GGT), a membrane-bound enzyme involved in glutathione metabolism, may serve as a non-invasive biomarker for hepatic fibrosis[5]. **Objective:** To assess serum gamma-glutamyl transferase (GGT) levels in chronic hepatitis B patients and determine its correlation with the severity of hepatic fibrosis using point shear wave elastography (pSWE). **Methods:** A hospital-based cross-sectional study was conducted at Assam Medical College and Hospital, Dibrugarh, from July 2021 to June 2022. Seventy adult patients with confirmed CHB were enrolled. Serum GGT levels were measured using the Vitros 5600 automated chemistry analyzer. Fibrosis was staged by pSWE, and data were analyzed using SPSS v20. A p-value < 0.05 was considered statistically significant. **Results:** Mean GGT levels rose progressively with fibrosis severity, ranging from 40.36 IU/L in patients with normal stiffness to 98.06 IU/L in cirrhotic cases. The association between serum GGT and fibrosis grade was highly significant ($p < 0.0001$). Most patients were male (71.43%) and from rural areas (58.57%). **Conclusion:** Serum GGT levels show a strong positive correlation with hepatic fibrosis severity in chronic hepatitis B, supporting its role as a cost-effective and non-invasive marker for liver fibrosis assessment, especially in low-resource settings.

KEYWORDS

Gamma-glutamyl transferase, chronic hepatitis B, hepatic fibrosis, elastography

INTRODUCTION

Hepatitis B virus (HBV) infection is a significant cause of chronic liver disease worldwide[1]. According to the World Health Organization (WHO), approximately 254 million people were living with chronic HBV infection in 2022, with about 1.2 million new infections each year[1]. Chronic HBV infection leads to progressive hepatic fibrosis, cirrhosis, and hepatocellular carcinoma (HCC), contributing substantially to global morbidity and mortality[2,3].

In India, the prevalence of hepatitis B surface antigen (HBsAg) positivity is around 3-4%, placing the country in the intermediate endemicity category[2]. Regional variations exist, with higher prevalence in the Andaman Islands and North-Eastern states such as Arunachal Pradesh, where tribal populations exhibit seroprevalence rates exceeding 15% [2,9].

Accurate assessment of hepatic fibrosis is crucial for determining prognosis and therapy in CHB. Liver biopsy remains the gold standard but is invasive, costly, and limited by sampling error [4]. Therefore, non-invasive biomarkers and imaging modalities such as point shear wave elastography (pSWE) have emerged as practical alternatives.

Gamma-glutamyl transferase (GGT), a membrane-bound enzyme involved in glutathione metabolism and oxidative stress response, has long been recognized as a sensitive indicator of hepatocellular injury and cholestasis[5]. Elevated serum GGT reflects hepatocyte membrane damage, oxidative stress, and biliary dysfunction[5]. Recent studies demonstrate its potential as a surrogate biomarker for necroinflammatory activity and hepatic fibrosis severity in chronic viral hepatitis.

This study was conducted to evaluate serum GGT levels in CHB patients and examine their correlation with the severity of hepatic fibrosis measured by pSWE.

MATERIALS AND METHODS

Study Design And Setting

This hospital-based, cross-sectional observational study was conducted in the Department of Medicine, Assam Medical College and Hospital, Dibrugarh, between July 2021 and June 2022.

Study Population

A total of 70 patients aged ≥13 years, diagnosed with CHB (HBsAg positive for >6 months), were enrolled after informed consent and approval by the Institutional Ethics Committee.

Exclusion Criteria

Patients with hepatitis C or D virus co-infection, HIV infection, autoimmune or alcoholic liver disease, inherited hepatic disorders, malignancy, or hepatotoxic drug exposure were excluded.

Data Collection

Detailed clinical histories and demographics were recorded. Serum GGT was measured using the Vitros 5600 automated chemistry analyzer. Viral markers including HBeAg and anti-HBc were tested by ELISA.

Assessment Of Hepatic Fibrosis

Hepatic fibrosis was evaluated non-invasively using point shear wave elastography (pSWE), expressed in kilopascals (kPa), and categorized as:
<5.3 (normal), 5.3 – <7.2 (mild), 7.2 – <9.4 (significant), 9.4 – <12.2 (severe), ≥12.2 (cirrhosis).

Statistical Analysis

All data were analyzed with SPSS v20. Continuous variables were expressed as mean ± SD, categorical as percentages. Group comparisons used ANOVA; $p < 0.05$ indicated statistical significance.

RESULTS

Demographic And Clinical Profile

Among 70 patients, the mean age was 41.41 ± 14.42 years (range 15–74 years). Most were male (71.43%) and rural residents (58.57%). Identifiable risk factors were found in 17.14% of cases, predominantly prior blood transfusion (11.43%).

Table 1. Demographic And Clinical Characteristics (n = 70)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	Mean ± SD	41.41 ± 14.42	–
Common Age Group	30–39 years	18	25.7

Sex	Male / Female	50 / 20	71.4 / 28.6
Locality	Rural / Urban	41 / 29	58.6 / 41.4
Risk Factors	Blood transfusion	8	11.4
	IV drug abuse	2	2.9
	High risk behaviour	2	2.9

Table 2. Association Between Mean Serum GGT Levels and Fibrosis Severity

Fibrosis Stage	Elastography (kPa)	n	Mean GGT (IU/L)	SD	p value
Normal	< 5.3	14	40.36	12.66	<0.0001
Mild Fibrosis	5.3–< 7.2	14	63.50	40.54	
Significant Fibrosis	7.2–< 9.4	8	53.50	13.93	
Severe Fibrosis	9.4–< 12.2	11	64.82	25.49	
Cirrhosis	≥ 12.2	23	98.06	43.58	

Serum GGT levels rose progressively with fibrosis stage, from 40.36 IU/L in normal livers to 98.06 IU/L in cirrhosis, demonstrating a highly significant positive correlation ($p < 0.0001$).

DISCUSSION

The study revealed a clear positive association between serum GGT levels and hepatic fibrosis severity in CHB. Mean GGT levels increased steadily across fibrosis stages, with the highest values among cirrhotic patients, confirming significant correlation ($p < 0.0001$).

The mean patient age (41.4 years) parallels other Indian and international studies, which show CHB predominating in young to middle-aged adults[7,8]. Male predominance (71.4%) is consistent with reports from China[9] and Turkey[8], where behavioral, hormonal, and sociocultural factors contribute to higher male exposure.

Rural predominance (58.6%) mirrors regional data from North-East India, where limited healthcare infrastructure and traditional practices enhance transmission risk[9]. Identifiable risk factors were present in only 17.1% of cases, suggesting perinatal or early horizontal transmission pathways, similar to findings by Lemoine et al[12].

The observed rise in GGT with increasing fibrosis corroborates prior studies. Yilmaz et al[7] reported mean GGT levels of 65.6 U/L in advanced fibrosis (Ishak 3–6) versus 26.9 U/L in mild stages ($p < 0.001$). Zhang et al[9] found GGT 90.4 U/L in advanced fibrosis versus 45.3 U/L in mild disease ($p < 0.001$). These values parallel our findings, emphasizing cross-population consistency.

Mechanistically, chronic HBV infection induces oxidative stress, leading to upregulation of GGT as part of glutathione metabolism and antioxidant defense[14]. Progressive fibrosis disrupts biliary canaliculi, causing increased GGT leakage into serum[5,14]. The enzyme's elevation thus reflects both hepatocellular injury and cholestatic component of chronic liver disease.

Composite indices like the GGT-to-platelet ratio (GPR), proposed by Li et al[10] and validated by Lemoine et al[12], improve diagnostic accuracy for significant fibrosis (≥ F2). However, GGT alone remains practical for screening in primary-care or resource-limited settings. When combined with elastography, it offers a comprehensive yet affordable fibrosis assessment strategy.

Clinical Implications

- Non-invasive Monitoring: GGT estimation can serve as a cost-effective, non-invasive screening tool for hepatic fibrosis in CHB.
- Resource-limited Utility: Especially valuable in rural or low-income regions lacking access to elastography or biopsy.
- Therapy Guidance: Serial GGT monitoring may aid in evaluating fibrosis progression or regression during antiviral therapy[13].
- Complementary Marker: Combining GGT with elastography or platelet indices may enhance staging accuracy and patient stratification.

Limitations And Future Directions

Limitations include the single-center design and modest sample size (n = 70), potentially limiting generalizability. Histopathological confirmation was not performed, as elastography served as the reference standard. Future multicentric, longitudinal studies should evaluate temporal GGT trends during antiviral treatment and explore integration of GGT-based indices into CHB management algorithms.

CONCLUSION

Serum gamma-glutamyl transferase (GGT) levels show a strong, statistically significant correlation with hepatic fibrosis severity among chronic hepatitis B patients, as measured by point shear wave elastography ($p < 0.0001$). GGT serves as a simple, inexpensive, and reliable biomarker for non-invasive fibrosis assessment, particularly beneficial in resource-constrained environments. Integrating GGT testing into routine CHB evaluation could facilitate earlier fibrosis detection, optimize treatment timing, and improve clinical outcomes.

REFERENCES

1. World Health Organization. Hepatitis B Fact Sheet. Geneva: WHO; 2023.
2. Batham A et al. Prevalence of hepatitis B in India: a systematic review and meta-analysis. Indian Pediatr. 2007; 44(9): 663–74.
3. Polaris Observatory Collaborators. Global prevalence, treatment, and prevention of hepatitis B virus infection in 2016. Lancet Gastroenterol Hepatol. 2018; 3(6): 383–403.
4. EASL Clinical Practice Guidelines. Management of Chronic Hepatitis B Virus Infection. J Hepatol. 2017; 67(2): 370–98.
5. Whitfield JB. Gamma-glutamyl transferase. Crit Rev Clin Lab Sci. 2001; 38(4): 263–355.
6. Schweitzer A et al. Estimations of worldwide prevalence of chronic HBV infection. Lancet. 2015; 386(10003): 1546–55.
7. Yilmaz Y et al. Non-invasive assessment of liver fibrosis with APRI. Hepat Mon. 2011; 11(2): 103–7.
8. Yilmaz Y et al. Gamma-glutamyl transferase as a fibrosis marker. Hepat Mon. 2011; 11(2): 103–7.
9. Zhang Y et al. Serum GGT levels reflect liver fibrosis severity in CHB. J Clin Lab Anal. 2014; 28(5): 386–91.
10. Li Q et al. Diagnostic value of GGT-to-platelet ratio in liver fibrosis. J Viral Hepat. 2016; 23(11): 830–7.
11. Gogoi M et al. Seroprevalence of HBV in tribal populations of Arunachal Pradesh. Indian J Med Res. 2015; 142(6): 721–6.
12. Lemoine M et al. The GGT-to-platelet ratio predicts significant fibrosis in chronic HBV. Gut. 2016; 65(8): 1369–76.
13. Wang JH et al. Liver stiffness decrease after antiviral therapy in CHB. J Gastroenterol Hepatol. 2010; 25(5): 964–9.
14. Whitfield JB. Gamma-glutamyl transferase and oxidative stress. Crit Rev Clin Lab Sci. 2001; 38(4): 263–355.