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STUDY OF SERUM VITAMIN B 12 LEVELS IN PATIENTS OF CHRONIC LIVER DISEASES.

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Abstract

Background: Chronic liver disease (CLD) is a major cause of morbidity and mortality worldwide. The liver serves as the principal storage site for Vitamin B12, and hepatic injury may alter its metabolism and serum concentration. ***Aims & Objectives:*** To study serum Vitamin B12 levels in patients with chronic liver disease and evaluate their association with disease severity and prognosis.***Materials and Methods:*** This observational longitudinal study was conducted in a tertiary care centre over a period of six months. A total of 60 adult patients diagnosed with chronic liver disease were included using convenience sampling. Clinical examination, laboratory investigations including liver function tests, serum electrolytes, serum Vitamin B12 estimation, and ultrasonography of the abdomen were performed. Disease severity was assessed using Child-Pugh classification. ***Results:*** A total of 60 patients were enrolled, with males constituting the majority of the study population. Alcohol-related liver disease was the most common etiology, followed by non-alcoholic steatohepatitis and hepatitis B infection. The mean serum Vitamin B12 level was elevated among patients with chronic liver disease. Higher Vitamin B12 levels were observed in patients with decompensated disease compared to compensated disease. Patients belonging to Child-Pugh Class C demonstrated significantly higher serum Vitamin B12 levels than those in Child-Pugh Class B. Patients with adverse outcomes exhibited the highest Vitamin B12 concentrations. Elevated serum Vitamin B12 levels showed a positive association with disease severity and poor prognosis. ***Conclusion:*** Serum Vitamin B12 levels are significantly elevated in patients with chronic liver disease and correlate with the severity of hepatic dysfunction.

Keywords: Chronic liver disease, Vitamin B12, Cobalamin, Child-Pugh score, Liver cirrhosis, Prognosis.

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INTRODUCTION

Chronic liver disease (CLD) is a major cause of morbidity and mortality worldwide and represents a significant public health challenge. It encompasses a spectrum of progressive liver disorders characterized by persistent hepatic injury, inflammation, fibrosis, and eventual cirrhosis, leading to hepatic decompensation and hepatocellular carcinoma. The common causes of CLD include chronic viral hepatitis, alcohol-related liver disease, non-alcoholic fatty liver disease (NAFLD), autoimmune hepatitis, and metabolic liver disorders.[1]

The liver plays a vital role in the storage, metabolism, and transport of several vitamins and micronutrients. Vitamin B12 (cobalamin) is an essential water-soluble vitamin required for DNA synthesis, erythropoiesis, and neurological function. Approximately 50–90% of the body's vitamin B12 stores are located in the liver, making it the principal storage organ for this vitamin.Serum vitamin B12 concentrations are traditionally measured to identify deficiency states; however, elevated serum vitamin B12 levels have increasingly been recognized as markers of underlying pathological conditions. Hypercobalaminemia has been associated with hematological malignancies, solid tumors, renal diseases, inflammatory disorders, and liver diseases.[2]

In chronic liver disease, serum vitamin B12 levels may become elevated due to hepatocellular damage resulting in the release of stored vitamin B12 into the circulation. Additionally, impaired hepatic uptake and clearance of vitamin B12-binding proteins contribute to increased serum concentrations. These mechanisms become more prominent as liver dysfunction progresses.[3]

Several investigators have reported significantly elevated serum vitamin B12 levels in patients with cirrhosis and advanced liver disease. Holdsworth et al. demonstrated that serum vitamin B12 concentrations correlated with the severity of hepatic dysfunction and may possess prognostic significance in patients with chronic liver disease.(4) Recent studies have suggested that serum vitamin B12 may serve as a useful non-invasive biomarker for assessing disease severity and prognosis in chronic liver disease. Elevated vitamin B12 concentrations have been shown to correlate with worsening Child-Pugh scores and advanced stages of cirrhosis.[5]

Despite growing evidence regarding the relationship between serum vitamin B12 levels and liver disease severity, data from the Indian population remain limited. Therefore, the present study was undertaken to evaluate serum vitamin B12 levels in patients with chronic liver disease and to assess their association with disease severity and clinical outcomes.

The primary objective of the study was to determine serum Vitamin B12 levels in patients with chronic liver disease. Secondary objectives included evaluating the association between serum Vitamin B12 levels and disease severity as well as their relationship with biochemical parameters of liver dysfunction.

MATERIALS AND METHODS

Study Design & Settings: This hospital-based observational longitudinal study was conducted in the Department of General Medicine at a tertiary care teaching hospital over a period of six months. The study included patients diagnosed with chronic liver disease attending the outpatient department or admitted to the inpatient wards during the study period.

Sample Size & Sampling Technique: A period based sample size was conducted, and all eligible patients fulfilling the inclusion criteria were enrolled using a convenience sampling technique making a total of 60 patients.

Study population: Patients aged 18 years and above with a diagnosis of chronic liver disease and willing to provide written informed consent were included in the study. The diagnosis of chronic liver disease was established based on clinical findings and imaging evidence obtained from ultrasonography or computed tomography showing features such as shrunken liver, nodular liver surface, altered hepatic echotexture, portal hypertension, splenomegaly, or ascites. Patients below 18 years of age, those receiving Vitamin B12 supplementation, and those unwilling to participate were excluded from the study.

Study Procedure: Chronic liver disease was defined as progressive deterioration of liver function persisting for more than six months and characterized by impairment of the liver's synthetic, metabolic, detoxification, and excretory functions. A detailed clinical history was obtained and recorded using a pre-structured questionnaire. Demographic data, clinical findings, and relevant medical history were documented for all study participants.

All enrolled patients underwent detailed clinical examination and laboratory investigations. Blood samples were collected under aseptic precautions for estimation of serum Vitamin B12 levels, liver function tests, and serum electrolytes. Serum Vitamin B12 levels were measured using standard laboratory methods according to institutional protocols. Ultrasonography of the abdomen and pelvis was performed in all patients to assess liver morphology and features suggestive of chronic liver disease and portal hypertension.

RESULTS

Table 1: Demographic Characteristics of Study Population

Variable	Value
Total Patients	60
Mean Age (years)	51.4 ± 11.2
Male	42 (70.0%)
Female	18 (30.0%)

Table 1 shows the demographic profile of the study participants. A total of 60 patients with chronic liver disease were included in the study. The mean age of the study population was 51.4 ± 11.2 years. Male patients constituted the majority of the study population [42 (70.0%)], while females accounted for 18 (30.0%).

Table 2: Etiology of Chronic Liver Disease

Etiology	Number (%)
Alcohol-related liver disease	34 (56.7%)
NASH	14 (23.3%)
Hepatitis B	7 (11.7%)
Cryptogenic/Others	5 (8.3%)

Table 2 depicts the etiological distribution of chronic liver disease among the study participants. Alcohol-related liver disease was the most common etiology, accounting for 34 (56.7%) cases, followed by non-alcoholic steatohepatitis (NASH) in 14 (23.3%) patients. Hepatitis B infection was observed in 7 (11.7%) patients, while 5 (8.3%) patients had cryptogenic or other causes of chronic liver disease. Alcohol consumption emerged as the leading cause of chronic liver disease in the present study.

Table 3: Distribution of Patients According to Disease Severity

Parameter	Number (%)
Compensated CLD	15 (25.0%)
Decompensated CLD	45 (75.0%)
Child-Pugh Class B	16 (26.7%)
Child-Pugh Class C	44 (73.3%)

Table 3 illustrates the severity of chronic liver disease among the study population. Of the 60 patients, 45 (75.0%) had decompensated chronic liver disease, whereas 15 (25.0%) had compensated disease. Based on Child-Pugh classification, 44 (73.3%) patients belonged to Child-Pugh Class C and 16 (26.7%) belonged to Child-Pugh Class B.

Table 4: Serum Vitamin B12 Levels According to Disease Severity

Group	Serum Vitamin B12 (pg/mL)
Overall CLD patients	1685 ± 520
Child-Pugh Class B	1120 ± 385
Child-Pugh Class C	1895 ± 375
Mortality group	2185 ± 145

Table 4 compares serum Vitamin B12 levels among different categories of chronic liver disease. The overall mean serum Vitamin B12 level was 1685 ± 520 pg/mL. Patients with Child-Pugh Class C disease demonstrated markedly higher Vitamin B12 levels (1895 ± 375 pg/mL) compared to Child-Pugh Class B patients (1120 ± 385 pg/mL). The mortality group also exhibited the highest mean Vitamin B12 concentration (2185 ± 145 pg/mL). These findings suggest a positive association between increasing serum Vitamin B12 levels and worsening severity of chronic liver disease.

Table 5: Distribution of Serum Vitamin B12 Levels in Compensated and Decompensated Chronic Liver Disease

Vitamin B12 Level (pg/mL)	Compensated n (%)	Decompensated n (%)	Total n (%)
600–1099	10 (16.7)	4 (6.7)	14 (23.4)
1100–1599	3 (5.0)	6 (10.0)	9 (15.0)
1600–2099	2 (3.3)	26 (43.3)	28 (46.6)
2100–2599	0 (0.0)	9 (15.0)	9 (15.0)
Total	15 (25.0)	45 (75.0)	60 (100.0)

Table 5 demonstrates the distribution of serum Vitamin B12 levels among compensated and decompensated chronic liver disease patients. Lower Vitamin B12 levels (600–1099 pg/mL) were predominantly observed in compensated patients, whereas higher Vitamin B12 concentrations (1600–2099 pg/mL and 2100–2599 pg/mL) were mainly seen among decompensated patients. Among patients with Vitamin B12 levels between 1600–2099 pg/mL, the majority belonged to the decompensated group. Similarly, all patients with Vitamin B12 levels above 2100 pg/mL were decompensated. These observations indicate that elevated serum Vitamin B12 levels are associated with progression and decompensation of chronic liver disease.

DISCUSSION

The present study was conducted to evaluate serum Vitamin B12 levels in patients with chronic liver disease (CLD) and their association with disease severity. The majority of patients in our study were males, with most belonging to the fifth decade of life. Similar male predominance has been reported in previous studies, largely due to the higher prevalence of alcohol-related liver disease among men.[6,7]

Alcohol-related liver disease was the most common etiology in our study, followed by non-alcoholic steatohepatitis (NASH) and hepatitis B infection. These findings are consistent with previous Indian studies that identified alcohol as the leading cause of chronic liver disease.[8]

A key finding of the present study was the significantly elevated serum Vitamin B12 levels in patients with chronic liver disease. The mean serum Vitamin B12 concentration was markedly higher than the normal reference range. Similar findings were reported by Muro et al., who observed significantly higher Vitamin B12 levels in cirrhotic patients compared to healthy controls.[9] Holdsworth et al. also demonstrated that elevated serum Vitamin B12 levels are frequently associated with liver disease and reflect hepatocellular injury.[10]

The elevation of serum Vitamin B12 levels in chronic liver disease can be explained by the fact that the liver is the major storage site for Vitamin B12. Progressive hepatocellular damage leads to leakage of stored Vitamin B12 into the circulation, while impaired hepatic uptake and clearance further contribute to increased serum concentrations.[11]

In the present study, serum Vitamin B12 levels increased with worsening disease severity. Patients with decompensated chronic liver disease had higher Vitamin B12 levels than those with compensated disease. Similarly, patients belonging to Child-Pugh Class C demonstrated significantly higher Vitamin B12 levels compared to Child-Pugh Class B patients. These observations are in agreement with the findings of Sugihara et al., who reported a positive association between elevated Vitamin B12 levels and advanced cirrhosis severity.[12]

Another important finding was the higher serum Vitamin B12 levels among patients who died during the study period. The mortality group exhibited the highest mean Vitamin B12 concentration, suggesting a possible relationship between elevated Vitamin B12 levels and poor prognosis. Similar observations were reported by Sugihara et al., who found that higher Vitamin B12 levels were associated with reduced survival in patients with chronic liver disease.[13]

Kanazawa et al. reported that patients with alcoholic liver disease had reduced hepatic Vitamin B12 stores but elevated plasma Vitamin B12 levels, indicating impaired hepatic retention and release of Vitamin B12 following liver cell injury.[14] Harsharan Kaur et al. also observed significantly elevated Vitamin B12 levels in cirrhotic patients compared with healthy controls.[15]

The findings of the present study suggest that serum Vitamin B12 may serve as a useful, inexpensive, and readily available biochemical marker for assessing disease severity and prognosis in patients with chronic liver disease. Elevated Vitamin B12 levels were associated with hepatic decompensation, advanced Child-Pugh class, and adverse outcomes.

The major limitation of the present study was the relatively small sample size and its single-center design. Further large-scale multicentric studies are required to validate the prognostic role of serum Vitamin B12 in chronic liver disease and to explore its utility in other liver disorders such as acute liver failure and hepatocellular carcinoma.

CONCLUSION

The present study demonstrated that serum Vitamin B12 levels are significantly elevated in patients with chronic liver disease and increase with worsening disease severity. Higher serum Vitamin B12 concentrations were observed in patients with decompensated liver disease and advanced Child-Pugh class. Elevated Vitamin B12 levels were also associated with poorer clinical outcomes and mortality. These findings suggest that serum Vitamin B12 may serve as a simple, inexpensive, and readily available biomarker for assessing disease severity and prognosis in patients with chronic liver disease. Further large-scale prospective studies are required to validate its prognostic utility and establish its role in routine clinical practice.

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