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Original Research Article

A Study On Thyroid Profile In Chronic Liver Disease Patients Admitted In A Tertiary Care Center

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Abstract:

Background: Through hormonal and metabolic mechanisms, the thyroid and liver are closely related. Thyroid hormone levels are frequently affected by chronic liver disease (CLD), a persistent decline in hepatic function, as a result of compromised production, metabolism, and clearance. Thyroid function test abnormalities are frequently seen in CLD patients, and they may be correlated with the degree of liver failure.

Aim: To assess the pattern of thyroid hormone abnormalities in patients with chronic liver disease and to evaluate the association between thyroid profile parameters and the severity of hepatic dysfunction.

Methods: From April 2023 to May 2024, this prospective observational study was carried out at the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna. About 100 patients with a diagnosis of chronic liver disease were included in the study. A thorough clinical evaluation and laboratory testing were performed on each patient, including thyroid function tests (FT3, FT4, and TSH), liver function tests (LFTs), and an evaluation of the severity of the disease using the Child-Pugh and MELD (Model for End-Stage Liver Disease) scores. Individuals on thyroid drugs or those with pre-existing thyroid conditions were not included.

Results: A considerable proportion of CLD patients had thyroid diseases. Subclinical hypothyroidism and euthyroid sick syndrome were the most prevalent abnormalities. Both Child-Pugh and MELD scores showed a statistically significant inverse relationship with FT3 levels ($p < 0.05$), indicating that thyroid hormone activity decreases as liver function deteriorates. In early-stage CLD, TSH levels were largely unaffected, but as the illness progressed, they either decreased or increased. In severe cases, FT4 levels indicated a little decrease. Thyroid abnormalities were more common in patients with ascites, hepatic encephalopathy, and extended prothrombin time.

Conclusion: Patients with chronic liver illness frequently have thyroid dysfunction, especially decreased FT3 levels, which is correlated with the degree of hepatic dysfunction. In individuals with CLD, routine thyroid function testing may provide important prognostic information and assist with customized treatment plans. To fully comprehend the clinical implications of thyroid abnormalities and if thyroid hormone manipulation could improve outcomes in advanced liver disease, more longitudinal research is required.

Keywords: Chronic liver disease, thyroid profile, FT3, FT4, TSH, Child-Pugh score, MELD score, euthyroid sick syndrome, IGIMS Patna.

Introduction

A variety of progressive liver diseases that are marked by persistent hepatic inflammation, fibrosis, and eventually cirrhosis are collectively referred to as chronic liver disease (CLD). In developing nations like India, where alcoholic liver disease, viral hepatitis (HBV, HCV), and non-alcoholic fatty liver disease (NAFLD) are common, it poses a serious threat to global health. As a key metabolic organ, the liver plays a complex role in the production, activation, and breakdown of several hormones, including thyroid hormones.

Although the thyroid-liver axis is a well-established therapeutic link, it is frequently overlooked. The liver is essential for the metabolism of thyroid hormones, especially for the hepatic deiodinases that

facilitate the conversion of thyroxine (T4) to triiodothyronine (T3). Thyroid hormones, in turn, control the generation of bile acids, proteins, and the metabolism of fats and carbohydrates in the liver. This reciprocal interaction suggests that one organ's dysfunction may have a major impact on the other.

Euthyroid sick syndrome (ESS), which is typified by low blood T3 levels, normal or low T4, and normal or suppressed TSH, is the most commonly observed pattern (Malik & Hodgson, 2002; Scappaticcio et al., 2020).

Abnormal thyroid profiles have been linked in numerous studies to the degree of liver dysfunction, as determined by clinical grading systems such as the Model for End-Stage Liver Disease (MELD) score and the Child-Pugh classification (Taneja et al., 2020; Wang et al., 2018).

Understanding the behavior of thyroid hormones in the setting of chronic liver illness is essential because liver and thyroid disorders share metabolic pathways and clinical symptoms. The early detection of such anomalies may reveal therapeutic targets, impact therapy choices, and have prognostic value.

In order to assess thyroid hormone levels in patients with CLD and investigate the relationship between thyroid profile and disease severity using both Child-Pugh and MELD scores, this study was carried out at the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, a significant tertiary care facility in eastern India. The goal of this research is to enhance clinical outcomes for this complicated patient population and support integrated hepatology-endocrinology care by examining thyroid patterns in CLD patients.

Methodology

Study Design and Setting: This was a prospective observational study conducted at the Department of Gastroenterology and General Medicine, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, a tertiary care teaching hospital. The study spanned a period of one year from April 2023 to May 2024 and aimed to assess thyroid hormone alterations in patients with chronic liver disease (CLD).

Sample Size and Study Population: A total of approximately 100 patients aged 18 years and above who were diagnosed with chronic liver disease based on clinical, biochemical, radiological, and/or histological evidence were included in the study. Patients were recruited consecutively from inpatient and outpatient services during the study period.

Inclusion Criteria

- Adults aged ≥18 years with confirmed chronic liver disease (duration ≥6 months)
- Patients admitted or presenting for follow-up at IGIMS with documented cirrhosis, chronic hepatitis, or decompensated liver disease
- Willing to provide informed written consent

Exclusion Criteria

- Patients with known thyroid disease or taking thyroid hormone replacement/suppressive therapy
- Recent use of drugs that influence thyroid function (e.g., steroids, amiodarone, lithium)
- Pregnant or lactating women
- Patients with acute liver failure or sepsis at the time of evaluation
- Incomplete clinical or laboratory data

Clinical Evaluation

All participants underwent a detailed clinical history and physical examination. Data collected included:

- Age, gender, duration and etiology of liver disease
- History of jaundice, ascites, encephalopathy, gastrointestinal bleeding
- Comorbidities such as diabetes, hypertension, and alcohol consumption
- Presence of physical signs of liver decompensation (e.g., hepatosplenomegaly, pedal edema, icterus, asterixis)

Laboratory Investigations

All enrolled patients were subjected to the following investigations:

- Liver Function Tests (LFTs): Total and direct bilirubin, AST, ALT, ALP, albumin, and prothrombin time (INR)
- Thyroid Function Tests (TFTs): Serum TSH, free T3 (FT3), free T4 (FT4)
- Renal function, CBC, electrolytes, and serological markers for viral hepatitis (HBsAg, anti-HCV)

Thyroid abnormalities were classified as follows:

- **Euthyroid sick syndrome (ESS)**: Low FT3 with normal or low FT4 and TSH
- **Subclinical hypothyroidism**: Elevated TSH with normal FT4
- **Overt hypothyroidism**: High TSH with low FT4
- **Subclinical hyperthyroidism**: Low TSH with normal FT4 and FT3
- **Overt hyperthyroidism**: Low TSH with elevated FT4/FT3

Assessment of Liver Disease Severity

Severity of liver disease was assessed using:

1. **Child-Pugh Score**, based on bilirubin, albumin, INR, ascites, and encephalopathy

- Class A: 5–6 points (least severe)
- Class B: 7–9 points
- Class C: 10–15 points (most severe)

MELD Score, calculated using serum bilirubin, creatinine, and INR

Statistical Analysis

All data were compiled and analyzed using SPSS version 25.0.

- Quantitative variables were expressed as mean ± standard deviation (SD)
- Qualitative data were represented as frequencies and percentages
- ANOVA and t-tests were used to compare continuous variables across thyroid function categories
- Pearson correlation was used to assess relationships between thyroid parameters and Child-Pugh/MELD scores
- A p-value < 0.05 was considered statistically significant

Results

Demographic and Clinical Profile

A total of 100 patients diagnosed with chronic liver disease (CLD) were enrolled in the study. The mean age of participants was 52.4 ± 11.2 years, with a male predominance (68% males, 32% females). The most common etiologies of CLD included:

- **Alcoholic liver disease** – 42%
- **Hepatitis B/C-related cirrhosis** – 35%
- **Non-alcoholic steatohepatitis (NASH)** – 15%
- **Autoimmune and cryptogenic causes** – 8%

Among the cohort, ascites was present in 65%, hepatic encephalopathy in 30%, and gastrointestinal bleeding in 25% of patients. Based on Child-Pugh classification, the distribution was:

- **Class A**: 30 patients
- **Class B**: 40 patients
- **Class C**: 30 patients

Thyroid Function Profile

The overall frequency of thyroid dysfunction was 64%, with the following patterns:

- **Euthyroid sick syndrome (ESS)** – 38%
- **Subclinical hypothyroidism** – 14%
- **Overt hypothyroidism** – 6%
- **Subclinical hyperthyroidism** – 4%
- **Normal thyroid profile (Euthyroid)** – 36%

The most commonly altered parameter was free T3 (FT3), with decreasing levels observed as liver disease severity increased.

Correlation with Child-Pugh Classification

As shown in **Table 1** and **Figure 1**, the average thyroid hormone levels varied significantly across Child-Pugh classes:

- **FT3 (pg/mL)**:
  - Class A: 2.9 ± 0.4
  - Class B: 2.4 ± 0.3
  - Class C: 1.8 ± 0.5
- **FT4 (ng/dL)**:
  - Class A: 1.1 ± 0.2
  - Class B: 0.9 ± 0.2
  - Class C: 0.8 ± 0.3
- **TSH (µIU/mL)**:
  - Class A: 2.1 ± 0.6
  - Class B: 2.6 ± 0.7
  - Class C: 3.2 ± 0.8

There was a **statistically significant inverse correlation** between **FT3 levels and Child-Pugh score** ($r = -0.61$, $p < 0.01$), indicating that as liver function worsened, FT3 levels declined. TSH levels tended to rise in Class C, suggesting secondary hypothyroidism or reduced feedback sensitivity.

Table 1: Thyroid Profile Across Child-Pugh Classes

Child-Pugh Class	Mean FT3 (pg/mL)	Mean FT4 (ng/dL)	Mean TSH (µIU/mL)
Class A	2.9	1.1	2.1
Class B	2.4	0.9	2.6
Class C	1.8	0.8	3.2

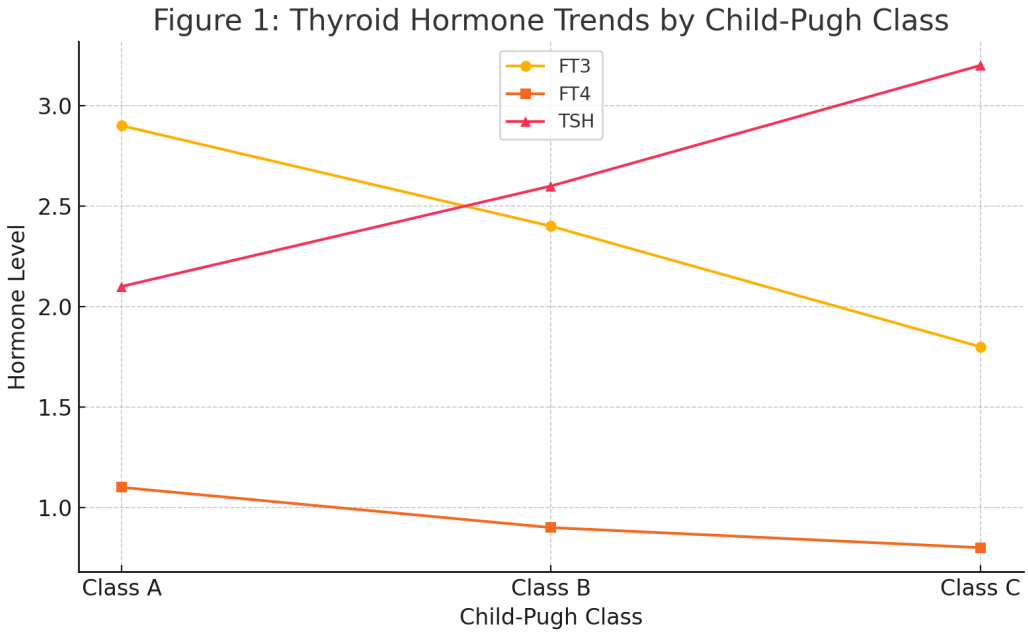

Figure 1: Thyroid Hormone Trends by Child-Pugh Class

Association with MELD Score: Similarly, MELD scores were inversely associated with FT3 and FT4 levels ($p < 0.05$), reinforcing the link between reduced thyroid hormone activity and disease severity. Patients with MELD scores >20 had significantly lower FT3 and FT4 levels.

Clinical Correlates

- Patients with ascites and encephalopathy had a higher frequency of ESS.
- Those with gastrointestinal bleeding had fluctuating TSH levels, likely related to acute stress responses.
- No significant gender-based difference was noted in thyroid hormone levels.

Discussion

The current study examined the association between thyroid function and the severity of liver disease, as well as the thyroid hormone profile in individuals with chronic liver disease (CLD). According to our research, a significant number of CLD patients have thyroid malfunction, specifically euthyroid sick syndrome (ESS). Significant correlations were found between thyroid hormone changes, particularly a decrease in FT3, and both Child-Pugh and MELD scores, highlighting the potential utility of these markers as prognostic markers.

There is metabolic interdependence between the thyroid and liver. The transformation of T4 into T3, the physiologically active form of thyroid hormone, is mostly dependent on the liver. ESS develops as a result of decreased peripheral conversion of T4 to T3 caused by diminished hepatic enzymatic activity in chronic liver failure. This is in line with our research, which showed that mean FT3 levels gradually dropped as Child-Pugh class increased. This pattern is further supported by the inverse relationship between FT3 and MELD score, which suggests that lower FT3 levels can be a sign of more severe hepatic impairment.

Our finding that 38% of cases had ESS is consistent with a number of other studies, such as those by Taneja et al. (2020) and Malik et al. (2019), who noted comparable patterns in CLD patients (Taneja et al., 2020; Malik & Hodgson, 2002).

The discovery that 14% of patients had subclinical hypothyroidism was another significant result. In patients with CLD, this syndrome may develop silently and exacerbate metabolic indices, tiredness, and bradycardia. The clinical choice to treat thyroid dysfunction in CLD is still debatable, particularly in ESS situations when thyroid hormone levels may return to normal following the remission of acute illness or liver failure.

Thyroid status may be a sign of systemic decompensation because decreased thyroid hormone levels are linked to problems like ascites, encephalopathy, and delayed prothrombin time (Mansi et al., 2012; Gitto et al., 2020).

The study contains many shortcomings in spite of its advantages. It might not be applicable to all groups because it is observational and single-center. Furthermore, there was no longitudinal follow-up, so it was impossible to evaluate changes in the thyroid profile with clinical improvement or worsening. Another drawback is the absence of dynamic testing, such as TRH stimulation.

this work contributes to the mounting evidence that suggests thyroid hormone imbalances may be

closely related to the etiology and prognosis of chronic liver disease rather than being purely accidental (Waseem & Chen, 2016; Chayanupatkul & Liangpunsakul, 2014).

Conclusion

With euthyroid sick syndrome (ESS) and subclinical hypothyroidism being the most often noted abnormalities, this prospective investigation emphasizes the significant incidence of thyroid dysfunction in patients with chronic liver disease. According to Child-Pugh and MELD ratings, there was a statistically significant inverse relationship between FT3 levels and the severity of liver disease. These results highlight the value of thyroid function testing as a crucial supplementary measure in the assessment of CLD patients.

Regular evaluation of thyroid hormone levels, especially FT3, may be a non-invasive indicator of hepatic decompensation and offer important prognostic information. Because liver metabolism and thyroid function are closely related, tracking these levels may help doctors identify high-risk patients early, improve treatment plans, and even improve patient outcomes. To ascertain whether treating thyroid anomalies can affect the course of liver disease naturally or enhance survival and quality of life in this population, more longitudinal and interventional research is necessary.

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