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Research Article

Association of Thyroid Profile in Chronic Liver Disease: A Cross-Sectional Study at a Tertiary Care Center in Bareilly

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ABSTRACT
Background: Chronic liver disease (CLD) significantly impacts thyroid hormone metabolism. The interplay between hepatic dysfunction and thyroid abnormalities can affect prognosis.
Aim: To assess the thyroid profile in patients with CLD and correlate thyroid function with liver disease severity.
Methods: This cross-sectional study included 94 CLD patients. Thyroid function tests (T3, T4, TSH) and liver function tests were analyzed. Child-Pugh scores were calculated to grade disease severity.
Results: A significant proportion of patients showed altered thyroid profiles, with low T3 syndrome being the most common abnormality. T3 levels inversely correlated with Child-Pugh scores, indicating that thyroid dysfunction worsened with liver disease progression.
Conclusion: Thyroid dysfunction, particularly low T3 syndrome, is common in CLD and correlates with disease severity. Routine thyroid evaluation in CLD patients may improve clinical outcomes.

Keywords: Chronic Liver Disease, Thyroid Profile, T3, T4, TSH, Child-Pugh Score, Prognosis

INTRODUCTION

The liver plays a pivotal role in thyroid hormone metabolism, including conjugation, deiodination, and synthesis of thyroxine-binding globulin (TBG). It is both a site and regulator of thyroid hormone activity. Chronic liver disease (CLD), characterized by progressive hepatic dysfunction over at least six months, can significantly impact thyroid hormone levels by disrupting hepatic metabolism and protein synthesis.

Thyroid hormones, particularly T3 and T4, regulate basal metabolic rate, growth, and energy homeostasis, and any alteration in their levels may worsen CLD progression. Conversely, liver disease can impair the conversion of T4 to T3, leading to a condition known as "low T3 syndrome" or non-thyroidal illness syndrome (NTIS). Given this bidirectional relationship, early recognition of thyroid dysfunction in CLD could provide valuable insights for prognostication and management.

Despite growing evidence of the thyroid-liver axis, routine assessment of thyroid function is often neglected in patients with CLD. This study aims to evaluate the association between thyroid profile and CLD severity, particularly in the context of the Indian population.

MATERIALS AND METHODS

Study Design and Setting: A cross-sectional study was conducted in the Department of General Medicine at Rajshree

Medical Research Institute, Bareilly, Uttar Pradesh between August 2023-July 2024.

Sample Size: A total of 94 patients diagnosed with CLD, aged 18 years and above, were enrolled. Diagnosis was based on clinical features, liver function tests, ultrasonography, and radiological evidence of chronic liver pathology.

Inclusion Criteria:

Clinically and radiologically confirmed CLD
Age >18 years
Willingness to provide informed consent.

Exclusion Criteria:

Pre-existing thyroid disorders
Patients on thyroid-altering drugs
Acute hepatic encephalopathy and
Renal failure.

Data Collection: Detailed history, clinical examination, and laboratory investigations were performed. Thyroid profile (T3, T4, TSH) and LFTs (bilirubin, albumin, AST, ALT, INR) were recorded. Disease severity was assessed using the Child-Pugh score.

Statistical Analysis: Data were analyzed using SPSS software. Continuous variables were expressed as mean ± SD and categorical variables as percentages. ANOVA, chi-square tests, and multivariate regression were used to determine statistical significance. A p-value <0.05 was considered statistically significant.

RESULTS

Demographics: 62 males (65.96%) and 32 females (34.04%); majority aged 31–50 years.

Thyroid Profile Findings: Low T3 syndrome in 46%, mild T4 reduction in 23%, TSH elevation in 31%.

Child-Pugh Class Distribution: Class A - 28 patients, Class B - 35 patients, Class C - 31 patients.

Table 1: Severity of CLD (CTP Score)

Child-Pugh Class	Frequency	Percentage	p-value
Class A (Mild)	28	29.8	<0.05
Class B (Moderate)	35	37.2	<0.05
Class C (Severe)	31	33.0	<0.05
Total	94	100.0	

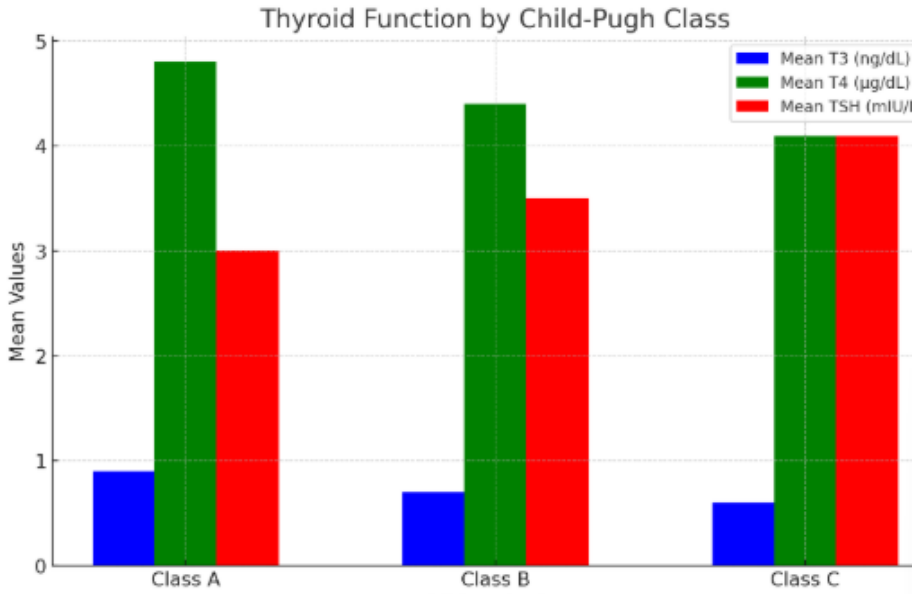
Table 2: Thyroid Profile in patients of CLD (Mean ± SD)

Parameter	**Mean ± SD**	**p-value**
T3 (nanogram/dL)	0.8 ± 0.2	<0.05
T4 (microgram/dL)	4.5 ± 1.3	<0.05
TSH (mIU/L)	3.2 ± 1.8	<0.05

Table 3: Thyroid Profile in Different Child-Pugh Classes

Child-Pugh Class	Mean T3 (nanogram/dL)	Mean T4 (microgram/dL)	Mean TSH (mIU/L)	p-value
Class A	0.9 ± 0.2	4.8 ± 1.2	3.0 ± 1.7	<0.05
Class B	0.7 ± 0.2	4.4 ± 1.1	3.5 ± 1.9	<0.05
Class C	0.6 ± 0.2	4.1 ± 1.0	4.1 ± 2.0	0.07

- Correlation Analysis: T3 inversely correlated with Child-Pugh score; TSH positively correlated with disease severity.



Prognostic Correlation:

- Low T3 levels and high TSH were significantly associated with-
    1. Higher mortality ($p<0.01$)
    2. Hypoalbuminemia
    3. Prolonged INR
- Patients with low T3 and high TSH had a threefold higher risk of poor prognosis compared to euthyroid CLD patients.

DISCUSSION

This study highlights a strong association between thyroid dysfunction and CLD severity. A notable proportion of patients exhibited NTIS, with isolated low T3 as the most frequent abnormality. This aligns with findings from previous studies by Wu et al. and Punekar et al., who reported reduced T3 and elevated TSH in advanced liver disease. The liver's role in converting T4 to T3 through type I deiodinase explains the fall in T3 levels in hepatic impairment. Moreover, impaired protein synthesis in cirrhosis affects TBG production, altering hormone transport and bioavailability. Interestingly, TSH levels were elevated in many CLD patients, indicating possible central dysregulation or a compensatory mechanism. These findings support the notion that thyroid hormone alterations are not merely epiphenomena but potential contributors to the pathophysiology and prognosis of CLD.

CLINICAL IMPLICATIONS

- Prognostic Marker: T3 levels may serve as a non-invasive marker of disease severity.
- Therapeutic Target: While routine hormone replacement is not universally indicated, selective thyroid hormone modulation may have future therapeutic implications.
- Multisystem Monitoring: Thyroid screening should be integrated into routine CLD assessment protocols, especially in decompensated patients.

Limitations

- Single-center study with a modest sample size.
- Cross-sectional design limits causal inference.
- Lack of follow-up data on thyroid hormone trends post-intervention.

CONCLUSION

Thyroid dysfunction is prevalent in chronic liver disease, with low T3 levels and elevated TSH correlating with disease severity. Monitoring thyroid function in CLD patients may help in prognostication and guide therapeutic strategies.

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