ORIGINAL RESEARCH PAPER

General Medicine

THYROID DYSFUNCTION IN PATIENTS WITH LIVER CIRRHOSIS AND ITS CORRELATION WITH THE SEVERITY OF LIVER DISEASE

KEY WORDS: Liver cirrhosis, Thyroid dysfunction, FT3, Child-Pugh score, Non-thyroidal illness syndrome

Dr. Alok Singh Postgraduate Resident, Pacific Institute Of Medical Sciences, Udaipur, India

Dr. Sachin Singhania Postgraduate Resident, Pacific Institute Of Medical Sciences, Udaipur, India

Dr. N.K. Gupta Professor And Head, Department Of General Medicine, Pacific Institute Of Medical Sciences, Udaipur, India

ABSTRACT

Background: Liver cirrhosis is associated with multiple systemic disturbances, including alterations in thyroid hormone metabolism. Given the liver's central role in converting and regulating thyroid hormones, thyroid dysfunction may mirror the severity of hepatic impairment. **Objective:** To study thyroid hormone levels in patients with cirrhosis and evaluate their correlation with liver disease severity using the Child-Pugh-Turcotte (CPT) score. **Methods:** A cross-sectional study involving 100 cirrhotic patients was conducted. Patients underwent clinical evaluation, biochemical tests including FT3, FT4, and TSH, and were classified using the CPT score. **Results:** FT3 and FT4 levels declined significantly as CPT class worsened, while TSH levels rose. A significant inverse correlation was observed between FT3/FT4 and CPT score (p=0.02), with a positive correlation for TSH (p=0.01). **Conclusion:** Thyroid dysfunction correlates with cirrhosis severity, especially FT3 decline, which may serve as a prognostic biomarker.

INTRODUCTION

The liver and thyroid function in close physiological harmony, each influencing the other's metabolic and hormonal pathways. The liver regulates thyroid hormone metabolism via deiodination, conjugation, and transport protein synthesis. In turn, thyroid hormones modulate hepatic lipid metabolism, bilirubin processing, and cellular oxidative activity. In liver cirrhosis, these interactions become dysregulated.

Cirrhosis leads to decreased synthesis of thyroid-binding proteins and impaired deiodinase activity, often resulting in a clinical picture of low FT3 and sometimes low FT4, despite normal thyroid gland function—a condition known as non-thyroidal illness syndrome (NTIS) or euthyroid sick syndrome. Conversely, longstanding liver dysfunction can induce subclinical or overt hypothyroidism.

Recognizing these endocrine abnormalities is crucial, as thyroid dysfunction may not only complicate the clinical picture but also reflect disease progression. Limited Indian studies have systematically analyzed thyroid profiles across CPT classes. This study was conducted to evaluate thyroid hormone abnormalities and their correlation with liver disease severity in cirrhotic patients.

MATERIALS AND METHODS

Study Design And Setting:

This hospital-based, cross-sectional study was conducted at the Department of General Medicine, Pacific Institute of Medical Sciences, Udaipur, from April 2023 to February 2025.

Inclusion Criteria:

- Patients ≥18 years with clinically and radiologically confirmed liver cirrhosis.
- Written informed consent provided.

Exclusion Criteria:

- Known thyroid disease or ongoing thyroid therapy
- Chronic kidney disease, active infection, malignancy
- Drugs interfering with thyroid metabolism (e.g., amiodarone, iodine)

Data Collection:

Patients underwent clinical examination and laboratory tests including liver function tests, CBC, renal function tests, and thyroid profile (FT3, FT4, TSH). CPT classification was used to assess liver disease severity.

Statistical Analysis:

Data were analyzed using SPSS v25. Quantitative data were expressed as mean ± SD. ANOVA and Pearson correlation tests were applied, with $p < 0.05$ considered statistically significant.

RESULTS

Among the 100 cirrhotic patients, 87% were male, and the mean age was 43.3 ± 13.1 years. The predominant etiology was alcohol (87%), followed by Hepatitis B (12%) and C (9%).

Ultrasound findings showed altered liver echotexture in all patients, with dilated portal veins (34%) and splenomegaly (31%). Ascites was present in 65% of cases (48% moderate, 10% severe). Hepatic encephalopathy grades ranged from I to IV in 59% of patients.

Child-Pugh Classification:

- Class A: 38%
- Class B: 22%
- Class C: 40%

Thyroid Function Findings:

- FT3: Declined from 3.43 ng/ml (Class A) to 1.98 ng/ml (Class C)
- FT4: Declined from 14.28 µg/dl (Class A) to 11.29 µg/dl (Class C)
- TSH: Rise from 4.45 µIU/ml (Class A) to 6.78 µIU/ml (Class C)

Table 14 Correlation between Thyroid function test and Modified Child Pugh Turcotte (CPT) Class

Variable	Modified Child Pugh Turcotte (CPT) Class						p-value *
	Class A		Class B		Class C		
	Mean	SD	Mean	SD	Mean	SD	
T3 (ng/ml)	3.43	0.67	2.25	0.46	1.98	0.67	0.03
T4 (µg/dl)	14.28	1.40	11.89	1.02	11.29	1.27	0.01
TSH (µIU/ml)	4.45	1.05	5.27	0.73	6.78	0.73	0.01

- * p-value < 0.05 statistically significant

Statistical analysis showed a significant inverse correlation between FT3/FT4 and CPT score ($p = 0.02$), and a positive correlation for TSH ($p = 0.01$), suggesting thyroid abnormalities worsen with liver disease progression.

DISCUSSION

This study demonstrates a strong association between liver cirrhosis severity and thyroid dysfunction. The decline in FT3 and FT4 levels with increasing CPT class supports the hypothesis that liver dysfunction impairs thyroid hormone metabolism. The liver's role in peripheral conversion of T4 to the biologically active T3 is well-documented, and reduced type 1 deiodinase activity in cirrhosis likely contributes to this observation.

Elevated TSH levels in advanced cirrhosis may reflect a compensatory response or a shift toward hypothyroidism beyond NTIS. These findings are consistent with Rajput et al., who noted a negative FT3 correlation with disease severity, and with Punekar et al., who highlighted a high prevalence of low T3 syndrome and raised TSH in cirrhotic patients.

Mechanistically, the systemic inflammation and metabolic stress in cirrhosis suppress hypothalamic-pituitary-thyroid (HPT) axis activity. Moreover, hepatic protein synthesis declines, reducing levels of thyroid-binding globulin and albumin, which affects hormone bioavailability. Our findings reinforce the idea that thyroid hormone abnormalities are not merely coincidental but pathophysiologically linked to liver failure.

Clinically, thyroid dysfunction in cirrhosis may exacerbate fatigue, cognitive impairment, or fluid imbalance, thereby influencing morbidity. While treatment of NTIS remains controversial, screening for thyroid dysfunction in cirrhotics can help identify patients at risk of progression or complications.

CONCLUSION

Thyroid dysfunction is common in cirrhotic patients and correlates significantly with liver disease severity. Declining FT3 and FT4, with elevated TSH levels, particularly in advanced CPT classes, suggest that routine thyroid screening in cirrhotic patients is justified. FT3 may serve as a useful non-invasive biomarker for monitoring disease progression and prognosis.

Funding

No external funding was obtained for this study.

Conflict Of Interest

The authors declare no conflict of interest.

Ethical Approval

The study was approved by the Institutional Ethics Committee of Pacific Institute of Medical Sciences. Written informed consent was obtained from all participants.

REFERENCES

1. Verma SK, et al. Evaluation of thyroid profile in liver cirrhosis. J Clin Diagn Res. 2017;11(3):OC01–OC04.
2. Rajput N, et al. Thyroid dysfunction in CLD and correlation with severity. J Assoc Physicians India. 2023;71(5):22–27.
3. Punekar P, et al. Thyroid profile in liver cirrhosis: A case–control study. J Clin Exp Hepatol. 2018;8(2):102–107.
4. Anand AV, et al. Correlation between thyroid dysfunction and liver cirrhosis severity. Int J Adv Med. 2023;10(1):24–28.
5. Ray G, et al. Hormonal imbalance in CLD: A cross-sectional analysis. Endocrinol Metab Clin North Am. 2019;48(4):775–788.