

## STUDY OF THYROID PROFILE IN CHRONIC LIVER DISEASE IN A TERTIARY CARE CENTRE

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### Abstract

**Background:** Chronic liver disease is one of the leading causes of mortality and morbidity worldwide. Among the various functions of the liver, one important function is the synthesis of carrier proteins and metabolism of hormones and hence liver diseases are associated with various endocrinal disturbances. Conversely, thyroid hormones have widespread systemic actions involving all organ systems such as CNS, Cardiovascular, Respiratory, Reproductive, Gastrointestinal, Liver and Mineral Metabolism. Hence, we have undertaken this research to study the status of thyroid hormones in a patient with chronic liver disease. **Objectives:** To study the levels of thyroid hormone in chronic liver disease. To study possible correlation between thyroid hormone levels and severity of chronic liver disease. **Materials and Methods:** This cross-sectional study included 80 patients with chronic liver disease admitted in a tertiary care hospital in Mysuru from Jan 2020 to July 2021. In patients satisfying inclusion criteria, the Child Pugh Turcotte scoring was used to classify severity of liver diseases, Thyroid hormone levels were measured and the data obtained was analysed using SPSS software version 22.0 and presented as descriptive statistics. **Result:** In this study, Chronic alcoholism was the most common cause of chronic liver diseases (88.6%) and majority belonged to Child Pugh Turcotte class C. Hypothyroidism was seen in 55% of cases, Euthyroidism was seen in 41% of cases and Hyperthyroidism was seen in 3.8% of cases of chronic liver disease. In the present study, hypothyroidism correlated with severity of chronic liver disease with statistically significant hypothyroidism seen in CPT class C ( $p < 0.05$ ). **Conclusion:** The present study concludes that Hypothyroidism is the most common type thyroid dysfunction (55%) seen in chronic liver disease and also shows positive correlation between hypothyroidism and severity of chronic liver disease. Hence, thyroid profiling should be carried out routinely in patients with chronic liver disease and presence of any thyroid dysfunction should be treated promptly and these parameters can also be used in prognostication of chronic liver disease patients.

## INTRODUCTION

Liver is the largest organ of the body which perform numerous and vital roles in maintaining homeostasis and health. These functions include synthesis of essential proteins, production of bile acid and salts and metabolism of nutrients, hormones, drugs and toxins.

Chronic liver disease is one of the leading causes of mortality and morbidity worldwide. The prevalence of liver diseases in India ranges from 4 to 17.5% which is likely to increase even more in the future.<sup>[1]</sup> Liver diseases are associated with various endocrinal disturbances, directly by the effects of toxins that are not metabolized by liver and indirectly by the alteration of the carrier protein synthesis. Therefore,

chronic liver disease may be accompanied by signs of apparent hormonal imbalance.

Thyroxine and Tri-iodothyronine are essential for normal organ growth, development and function. These hormones regulate the basal metabolic rate of all cells, including hepatocytes and thereby modulate hepatic function. The liver plays an important role in metabolism of thyroid hormones, being involved in their conjugation, excretion, peripheral de-iodination and the synthesis of thyroxine binding-globulin (TBG).

Hence, chronic liver disease has been associated with differing effects on thyroid hormone metabolism and conversely, alterations in thyroid function can lead to liver dysfunction.<sup>[2,3]</sup>

Even though Thyroxine is secreted at a higher rate quantitatively, it is regarded as a pro hormone that requires de-iodination of T4 and conversion to T3 to become biologically active. This reaction occurs in the thyroid and extra-thyroidal system. T3 is released from the thyroid, but approximately 80% of it is derived from the peripheral tissues by the enzymatic removal of a single 5' iodine atom (outer ring or 5'monodeiodination) from T4. Out of this about 30-40 percent of extra-thyroidal conversion occurs in the liver. Apart from this, the liver also plays an important role in the inactivation of thyroid hormones by deiodinase 3.<sup>[4-6]</sup>

In addition to the primary role in de-iodination to activate and deactivate thyroid hormones, the liver performs specific functions relating to thyroid hormone transport. The slow clearance, prolonged half-life, and high serum concentration of thyroxine (T4) are largely due to a strong binding by the principal plasma thyroid hormone binding proteins like thyroxine-binding globulin (TBG), transthyretin (TTR) and albumin.<sup>[7,8]</sup>

Hence the present study has been conducted to establish the relationship between thyroid hormones (by measuring FT3, FT4, TSH) and chronic liver disease.

#### Objectives of the Study

1. To study the levels of thyroid hormone in chronic liver disease.
2. To study possible correlation between thyroid hormone levels and severity of chronic liver disease.

## MATERIALS AND METHODS

The Cross-Sectional Observational study was conducted among 80 Patients who presented to the Department of Medicine in Tertiary Care Hospital-KR Hospital, Mysuru from Jan 2020 to July 2021.

#### Inclusion Criteria

Patients aged more than 18years with chronic liver disease based on clinical grounds, impaired liver function tests and ultrasonographic pictures consistent with chronic liver disease.

#### Exclusion Criteria

1. Known case of thyroid dysfunction

2. Acute hepatitis and fulminant liver failure
3. Chronic renal failure
4. Congestive heart failure
5. Malignancy
6. Drugs effecting thyroid function

#### Methodology

Institutional ethical committee approval has been taken. Subjects were enrolled in the study as per inclusion and exclusion criteria. All subjects included in the study were explained about the procedure, valid informed written consent was taken, detailed clinical, biochemical (TFT, LFT and other routine investigations) and ultrasonographical evaluations were done. The Child Pugh Turcotte score was calculated and the subjects were categorized based on severity of liver disease.

#### Statistical Analysis

Data obtained from the study is entered in excel sheets and analyzed using SPSS software version 20.0(Trial version) and presented as descriptive statistics in the form of frequency, tables, figures and graphs. Results are expressed as mean  $\pm$  SD. ANOVA test will be used for testing the significance between the groups. Correlation of parameters is done by Pearson's correlation formula. A p value of <0.05 is considered statistically significant.

## RESULTS

In this study, majority of the cases belong to the age group of 31-40 years (35%), followed by 41-50 years (26%) and 51-60 years (22%). The mean age of the study being 38.2 years. Of 80 cases, males were 67 and females were 13.

#### Etiology Of Chronic Liver Disease:



Etiology	N	Percentage
Alcohol	71	88.6
Viral	3	3.8
NASH	3	3.8
Toxins	0	0
Cryptogenic	3	3.8
Malignancy	0	0
Autoimmune	0	0

Chronic alcoholism was the cause of liver diseases in majority of the cases (88.6%).

### Thyroid Status In Chronic Liver Disease:

In this study, Hypothyroidism was seen in 55% of cases, Euthyroidism was seen in 41% of cases and Hyperthyroidism was seen in 3.8% of cases.

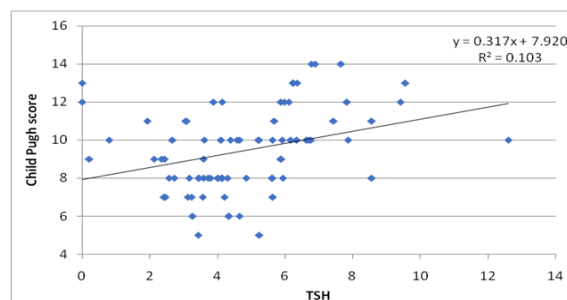
Thyroid status	Number	Percentage
Hypothyroidism	44	55
Euthyroidism	33	41.2
Hyperthyroidism	3	3.8

### Severity Of Chronic Liver Disease Based CPT Scoring System

CPT class	Frequency	Percent
Class A	5	6.3
Class B	31	38.8
Class C	44	55.0

Total	80	100.0
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In this study, majority of the cases belonged to CPT class C, followed by class B and the least was A.



**Table:**

TFT and CPT SCORE				
		N	Mean	Std. Deviation
TSH	Class A	5	4.1830	0.82931
	Class B	31	3.9659	1.53457
	Class C	44	5.4220	2.49230
	Total	80	4.7803	2.19596
T4	Class A	5	5.1940	1.96344
	Class B	31	5.7692	2.41920
	Class C	44	5.9898	3.05819
	Total	80	5.8546	2.74753
T3	Class A	5	35.9500	25.75236
	Class B	31	108.7239	44.17789
	Class C	44	110.8507	41.96234
	Total	80	111.5953	42.12175

### ANOVA

	F	P value
TSH	4.575	.013
T4	.209	.812
T3	.913	.406

In the present study, hypothyroidism correlated with severity of chronic liver disease with significant hypothyroidism seen in CPT class C.

Correlations		
		TSH
CPT score	R-value	0.322
	P-value	0.004

## DISCUSSION

Liver plays an important role in thyroid hormone metabolism and is also the site of synthesis of TBG. In patients with chronic liver disease deiodinase activity is reduced and peripheral conversion of T4 and T3 is reduced. In the present cross-sectional study, chronic liver disease patients were studied to assess thyroid hormone status and to establish possible correlation between severity of liver disease. In the present study, 80 patients were included of which majority were males with sex ratio being 5:1 which is comparable to Bethiun et al,<sup>[9]</sup> (4.8:1) and Buden et al (3:1).<sup>[10]</sup> The mean age of the present study is 38.2 years comparable to Punekar et al,<sup>[11]</sup> (43 years) and Buden et al (43).

In this study, Hypothyroidism was seen in 55% of cases which is comparable to Nilesh et al,<sup>[12]</sup> (48%),

Punekar et al (46.3%) and Buden et al (46.3%). The study shows positive correlation between hypothyroidism and severity of liver disease on comparing mean serum TSH value among CPT Class A, B and C, it was found highest in Class C (5.4±2.4) with statistically significant (p value <0.05) hypothyroidism in Child Pugh Turcotte Class C which is comparable to Punekar et al.

## CONCLUSION

Thyroid dysfunction is common in patients with chronic liver disease as liver plays a vital role in the metabolism of thyroid hormones as well as in the synthesis of carrier proteins which is involved in prolonging the half-life of thyroid hormones. The present study concludes the same with Hypothyroidism being the most common type

thyroid dysfunction (55%) and also shows positive correlation between hypothyroidism and severity of chronic liver disease.

Hence, thyroid profiling should be carried out routinely in patients with chronic liver disease and presence of any thyroid dysfunction should be treated promptly as thyroid hormones play an important role in the normal functioning of various systems and organs. Additionally, these parameters can also be used to assess the severity and in prognostication of liver diseases.

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