

TITLE:

EVALUATION OF THYROID PROFILE IN CIRRHOTIC PATIENTS AND ITS CORRELATION WITH CHILD PUGH SCORE

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Abstract:

Introduction: Liver plays vital role in metabolism of thyroid hormone. The liver is the most important organ in the peripheral conversion of tetraiodothyronine (T4) to T3 by Type 1 deiodinase^{1,2}. Type I deiodinase is the major enzyme in the liver and accounts for approximately 30%–40% of extrathyroidal production of T3, it can carry out both 5'-and 5-deiodination of T4 to T3. Moreover, the liver is involved in thyroid hormone conjugation and excretion, as well as the synthesis of thyroid binding globulin³. T4 and T3 regulate the basal metabolic rate of all cells, including hepatocytes, and thus modulate hepatic function also. Thyroid diseases affect liver function; liver disease may affect thyroid hormone metabolism; and a variety of systemic diseases affect both the organs. There are clinical and laboratory associations between thyroid and liver diseases. Patients with chronic liver disease may have thyroiditis, hyperthyroidism, or hypothyroidism. Patients with subacute thyroiditis or hyperthyroidism may have liver function abnormalities, which return to normal as the thyroid function improves.⁴ Available studies suggest that the most frequent change is decreased total T3 and free T3 concentration which is reported to be associated with severity of hepatic dysfunction. Serum T4 levels either remain normal or slightly low. However, serum TSH levels remain normal or slightly raised. These changes in thyroid hormone levels are so well established that these can be used as a sensitive index of liver function.^{5,6}

Aims and objectives: To study thyroid profile in liver cirrhosis and its correlation to Child Pugh Score.

Method: It is a hospital based prospective study of 50 patients with cirrhosis of the liver admitted in the Department of General Medicine at NHL Medical College, Ahmedabad, Gujarat. The material for study was formed by adult patients admitted in this institute between April 2020 to April 2022 fulfilling the inclusion and exclusion criteria.

Results: The most common cause of cirrhosis was alcohol (56%), and ascites (70%) was the most common presenting feature with majority of patients in 49.5 ± 6.9 age group. Highest number of patients (44%) had Child-Turcotte- Pugh Score B. Number of patients with FT3 and T3 lower than normal was significantly increased along with Child Pugh scores.

Conclusion: In conclusion, Thyroid function tests can be conducted in cirrhotic patients to assess the severity of liver disease.

Key words: Cirrhosis, Thyroid function, Child-Turcotte-Pugh score.

INTRODUCTION

Currently, cirrhosis and liver cancer cause 1.16 million and 788,000 deaths per year globally, respectively, making them the 11th and 16th most common causes of death, respectively. Together, they are responsible for 3.5% of all deaths worldwide. There are clinical and laboratory associations between thyroid and liver diseases. The major causes of cirrhosis of the liver are alcohol and viral hepatitis.⁷ Liver diseases are extremely common worldwide and also in India and the prevalence of liver disease is likely to increase even more in the future.⁸ Liver plays a vital role in metabolism and circulation of thyroid hormone by producing thyroid binding globulin.⁹ Liver also plays a role in the production of triiodothyronine (T3) by the action of selenium dependent 5' deiodinase. Moreover, another selenium independent deiodinase acts on the phenolic ring of thyroxine (T4) to produce the hormonally inactive reverse T3 (rT3).¹⁰ The liver is the most important organ in the peripheral conversion of tetraiodothyronine (T4) to T3 by Type 1 deiodinase^{6,7}. Type I deiodinase is the major enzyme in the liver and accounts for approximately 30%–40% of extrathyroidal production of T3, it can carry out both 5'-and 5-deiodination of T4 to T3. Moreover, the liver is involved in thyroid hormone conjugation and excretion, as well as the synthesis of thyroid binding globulin.⁸

AIMS AND OBJECTIVES:

AIM: To study thyroid profile in liver cirrhosis and its correlation to Child Pugh Score.

OBJECTIVE: To assess the severity of liver disease in relation to Thyroid Function and to find out the significance of thyroid hormone level and severity of cirrhosis of liver through Child Pugh Score.

METHODS: It is a hospital based prospective study of 50 patients of liver cirrhosis, which was conducted at Department of General Medicine, NHL Medical College, Ahmedabad, Gujarat. The material for this study was formed by adult patients admitted at this hospital, between April 2021 to April 2022 fulfilling the inclusion and exclusion criteria.

INCLUSION CRITERIA: Age >18 years male and female, diagnosed with cirrhosis of liver. Patients giving consent for the study.

EXCLUSION CRITERIA: Known case of thyroid disease. Patients receiving drugs that may interfere with thyroid hormone metabolism and function. Patients with any other chronic illness. Patients not giving consent for the study. Patients who do not meet up the inclusion criteria.

ETHICAL ASPECTS: The study protocol was approved by Institutional Ethics Committee (IEC) and data were collected after taking informed consent from the patients.

SAMPLING METHOD AND DIAGNOSTIC TOOL: All patients were assessed with detailed history including past history of jaundice, blood transfusion, marital and sexual history along with history of alcoholism. Physical examination in search of stigmata of chronic liver disease was done in all patients. Thyroid function tests in the form of Serum T3, T4, TSH, FT3, FT4 were done in fasting period (of at least 6-8 hours). Details were recorded in the proforma. The normal range of thyroid functions in our

laboratory: Serum T3 : 0.6-1.81 ng/ml ; Serum T4 : 3.2-12.6 mcg/dl ;Serum FT3 : 2.1-4.4 ng/ml; Serum FT4 : 0.8-2.7 ng/dl ; Serum TSH : 0.35-5.5 μ IU/ml

STATISTICAL METHOD: The data was recorded and entered in Microsoft Excel Worksheet. IBM SPSS version 22 has been used for statistical analysis. Categorical data was represented in terms of frequencies and proportions. Chi-square test and t-test were used as a test of significance for qualitative data. Continuous data was represented as mean and standard deviation. P value < 0.05 has been considered statistically significant.

RESULTS AND DISCUSSION:

A total of 50 liver cirrhosis cases were included in this study out of which 39(78%) were male and 11(22%) were female. The mean age of population was 49.5 years with 6.9 SD (49.97 in males and 47.72 years in females) with maximum number of patients in the age group of 46-55 years (34 patients). Ascites (70%) was found to be the most common clinical feature and other features included jaundice (36%), hepatic encephalopathy (28%), upper Gi bleeding (22%), anemia (22%).

Table 1: Distribution Of Patients According To Child Pugh Score [N=50]

CHILD PUGH SCORE	NUMBER	%
A	12	24
B	22	44
C	16	32

This study shows that Child Pugh Score A, B, C was observed in 24%, 44% & 32% patients respectively and the highest number of patients (44%) belonged to Child Pugh Score B followed by Score C. This shows that most of the patients presented to us in the advanced stage with decompensated liver cirrhosis.

Table 2: Distribution Of Patients According To T3 Level [N=50]

T3(ng/ml)	NUMBER	%
<0.6	31	62
0.6-1.81	18	36
>1.81	01	2

Table 3: Association of T3 Level with the Child Pugh Score [N=50]

T3(ng/ml)	Child Pugh Score						P value
	A (n=12)	%	B (n=22)	%	C (n=16)	%	
<0.6	1	8.3	17	77.3	13	81.3	0.0001
0.6-1.81	11	91.7	4	18.2	3	18.8	
>1.81	0	0	1	4.5	0	0	

Table 4: Distribution Of Patients According To FT3 Level [N=50]

FT3 (ng/ml)	NUMBER	%
<2.1	34	68
2.1-4.4	11	22
>4.4	5	10

Table 5: Association of FT3 Level with the Child Pugh Score [N=50]

FT3 (ng/ml)	Child Pugh Score						P value
	A (n=12)	%	B (n=22)	%	C (n=16)	%	
<2.1	2	16.7	17	77.3	15	93.8	0.0002
2.1-4.4	6	50	4	18.2	1	6.3	
>4.4	6	33.3	1	4.5	0	0	

DISTRIBUTION ACCORDING TO T3, FT3 LEVEL & CHILD PUGH SCORE: The study found that the highest number of patients had a low T3(62%) and FT3(68%) levels; lower levels of T3 and FT3 was significantly associated with advanced hepatic dysfunction according to Child Pugh Score as shown in table 1-5.

According to Deepika G et al¹¹ in a study on 310 cirrhotic patients revealed that cirrhotic patients had more prevalent thyroid dysfunction specially hypothyroidism. Study done by Neeralagi S et al¹², D'costa and Dhume et al¹³, Saleem and Wadea et al¹⁴, Kayacetin et al¹⁵, El-Sawy and Tawfi et al¹⁶ noted significant association between T3 level and Child Pugh Score

Table 6: Distribution Of Patients According To T4 Level [N=50]

T4 (ng/ml)	NUMBER	%
<03.2	8	16
3.2-12.6	41	82
>12.6	01	2

Table 7: Association of T4 Level with the Child Pugh Score [N=50]

T4(ng/ml)	Child Pugh Score						P value
	A (n=12)	%	B (n=22)	%	C (n=16)	%	
<3.2	4	33.3	2	9.1	2	12.5	0.22
3.2-12.6	8	66.7	20	90.9	13	81.3	
>12.6	0	0	0	0	1	6.3	

Table 8: Distribution of Patients According to FT4 Level [N=50]

FT4 (ng/ml)	NUMBER	%
<0.8	16	32
0.8-2.7	33	66
>2.7	01	02

Table 9: Association of FT4 Level with the Child Pugh Score [N=50]

FT4 (ng/ml)	Child Pugh Score						P value
	A (n=12)	%	B (n=22)	%	C (n=16)	%	
<0.8	1	8.3	9	40.9	6	37.4	0.16
0.8-2.7	11	91.7	13	59.1	9	56.3	
>2.7	0	0	0	0	1	6.3	

Present study found non-significant association between T4, FT4 levels and Child Pugh Score. Highest number of patients had normal T4(82%) and FT4(66%) levels. Only 2% had higher T4 level and 16% had low T4 level. So, there was a non-significant association between T4 level and Child Pugh Score. This study found that the highest number of patients (66%) had normal FT4 level followed by 32% having low FT4 level and only 2% having higher FT4 level. So, there was a non-significant association between FT4 level and Child Pugh Score. Study done by Neeralagi S et al¹², Deepika G et al¹¹ & El-Feki MA et al¹⁷ noted significant association between T4 level and Child Pugh Score.

Table 10: Distribution of Patients According to TSH Level [N=50]

TSH(μ IU/ml)	NUMBER	%
0.35-5.5	18	36
5.5-10	32	64

Table 11: Association of TSH Level with the Child Pugh Score [N=50]

TSH(μ IU/ml)	Child Pugh Score						P value
	A (n=12)	%	B (n=22)	%	C (n=16)	%	
0.35-5.5	11	91.7	5	22.7	2	12.5	0.001
5.5-10	1	8.3	17	77.3	14	87.5	

Our study found that the highest number of patients (64%) had an increased TSH level which was significantly associated with advanced hepatic dysfunction according to Child Pugh Score. Studies done by Neeralagi S et al¹², Deepika G et al¹¹, El-Feki MA et al¹⁷, Punekar P et al¹⁸ & Antonelli A et al¹⁹ noted significant association between TSH level and Child Pugh Score. Studies done by Verma SK et al²⁰, Mousa HA et al²¹ did not find significant association between TSH level and severity of cirrhosis of liver.

CONCLUSION:

Total 50 patients were included in this study, out of which 31 (62%) patients had low T3 and 10(2%) had a higher T3 level. Low FT3 was found in 34 (68%) patients and only 5 (10%) had a higher FT3 level. TSH was found to be elevated in 32 (64%) patients. Higher TSH was significantly associated with advanced hepatic dysfunction according to Child Pugh Score. Low levels of serum T3 and FT3 with elevated TSH were found in the patients of liver cirrhosis and was associated with higher Child Pugh Score. Therefore, thyroid levels in cirrhotic patients can be used as a prognostic marker.

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