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A STUDY ON EVALUATION OF THYROID FUNCTION TEST IN CHRONIC LIVER DISEASE PATIENTS ATTENDING A TERTIARY CARE HOSPITAL

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ABSTRACT:

INTRODUCTION: Liver diseases can have various associated endocrine disturbances. The liver plays crucial role in thyroid hormones metabolism through conjugation, excretion, peripheral de-iodination, and production of thyroxine-binding globulin (TBG). Liver dysfunction can result from changes in thyroid function, and distinct liver conditions can have different impacts on the metabolism of thyroid hormones. This study aims to assess the severity of liver dysfunction in relation with thyroid functions in patients with CLD attending a tertiary care hospital.

MATERIALS AND METHODS: This hospital based Cross-sectional study was conducted among 100 patients in the Department of General Medicine for one year at a tertiary care centre. A full history, including history of coronary artery disease, hypo-or hyperthyroidism therapy in the past, and chronic renal illness among patients and attendees. Basic laboratory tests were performed, such as a complete blood picture, Liver function test, PT/INR, Renal function test, Abdominal ultra sonography, and Thyroid function test with serum free T3,Total T3, freeT4, Total T4 and TSH measurements.

RESULT: The majority of patients belonged to the group of 31-40 years, with 29%. Among 100 patients. 76% are Males and 24%are Females, with more prevalence in males than females. 24 cases (24%) were Child-Pugh class A, 45 cases (45%) were Child-Pugh class B, and 31 cases (31%) were Child-Pugh class C. In our study it was observed that as liver disease progresses, as reflected in higher Child-Pugh scores, Total T3, Total T4, free T3 and free T4 levels decreased and TSH levels increased.

CONCLUSION: The findings of the study highlight the importance of regular thyroid function monitoring in assessing and managing CLD patients. Additionally, the significant gender disparities observed in disease severity emphasize the need for gender-specific approaches in CLD management. These insights can guide more effective clinical interventions and improve patient out comes in chronic liver disease**.**

Keywords: Child-Pugh Score, Thyroid profile, Chronic liver disease.

INTRODUCTION:

Liver is a vital organ in human body. The formation of transport proteins and the hormonal metabolism are the main functions of the liver. The prevalence of liver disease is already very high both globally and in India and it is expected to rise much further in the future.[1] Liver diseases can have various associated endocrine disturbances. The liver plays crucial role in thyroid hormones metabolism through conjugation, excretion, peripheral de-iodination, and production of thyroxine-binding globulin (TBG). Liver dysfunction can result from changes in thyroid function, and distinct liver conditions can have different impacts on the metabolism of thyroid hormones. [2,3] The liver's central role in metabolic processes means its dysfunction can have far-reaching effects on various bodily systems, including the endocrine system. Thyroid hormones, critical for numerous physiological functions, can be markedly affected in patients with CLD. This interplay between liver disease and thyroid function necessitates a comprehensive evaluation to understand the extent and implications of thyroid dysfunction in these patients. [4]

Various scores have been used for the assessment of prognosis in patients of CLD such as Child Turcotte Pugh (CTP) score, model for end stage liver disease (MELD) score, etc. Child and Turcotte initially gave Child-Pugh score in patients undergoing porto systemic shunt surgery for variceal bleeding to predict the operative risk. That score included following parameters, ascites, nutritional status, total bilirubin, hepatic encephalopathy (HE) and albumin. Pugh et al provided a modification by substituting clinical nutrition status with prothrombin time. CTP class A: 5-6 points, CTP class B: 7-9 points, CTP class C: 10-15 points). [5]

Thyroid function tests (TFTs), including measurements of serum thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free tri iodo thyronine (FT3), provide crucial insights into thyroid health. In CLD, these tests can reveal alterations such as low serum levels of FT3 and FT4. Low thyroid hormone levels are frequently observed in patients with severe liver disease and are associated with poor prognosis. The liver's role in converting T4 to T3 and in the clearance of thyroid hormones underscores the importance of evaluating thyroid function in CLD patients. [6]

This study aims to assess the severity of liver dysfunction in relation with thyroid functions in patients with CLD attending a tertiary care hospital

MATERIALSANDMETHODS:

This hospital based Cross-sectional study was conducted among 100 patients in the department of General Medicine for one year at a tertiary care centre after t a k i n g approval from the Institutional Ethical Committee. Informed written consent was taken from all patients participating in the study.

Inclusion criteria: Patients with symptoms signs with biochemical and radiological evidence of chronic liver disease, Patients in agegroup18-75years and the patients willing to participate in the study

Exclusion criteria: Patients on thyroid medications already, Patients with upper gastrointestinal bleeding, Patients with acute hepatic encephalopathy& the Patients with renal failure.

A full history including history of coronary artery disease, hypo-or hyperthyroidism therapy in the past, and chronic renal illness among patients and attendees. Basic laboratory tests were performed,

such as a complete blood picture, Liver function test, PT/INR, Renal function test, Abdominal ultra sonography, and Thyroid function test with serum free T3,Total T3, freeT4, Total T4andTSH measurements. Data was analyzed using statistical package-SPSS Software

RESULTS:

Out of 100 patients, 7% were under 30,29% were between 31-40 ages, 26% were between 41-50, 22% were between 51- 60,14% were in between61-70,2% were above70. The majority of patients belonged to the group of 31-40 years, with 29%.among 100patients: 76%are Males and 24% are Females, with more prevalence in males than females as shown in Table 1

TABLE1:BASIC PROFILE OF PATIENTS

Basic Profile	Frequency (n=100)	PERCENTAGE
AGE		
<30	7	7%
31-40	29	29%
41-50	26	26%
51-60	22	22%
61-70	14	14%
>70	2	2%
GENDER		
Male	76	76%
Female	24	24%

24 cases (24%) were Child-Pugh class A, 45 cases (45%) were Child-Pugh class B, and 31 cases (31%) were Child-Pugh class C as shown in Table 2

TABLE2: DISTRIBUTION OF PATIENTS ACCORDING TO CHILD-PUGHCLASS

CHILD-PUGHCLASS	Frequency (n=100)	PERCENTAGE
A	24	24%
B	45	45%
C	31	31%

out of Child-Pugh class A has four females and 20 Males, Child-Pugh class B has 45 Males, and Child-Pugh class C has 20 females and 11 males as shown in Table 3

TABLE 3: DISTRIBUTION OF PATIENTS ACCORDING TO CHILD-PUGH SCOREAND GENDER

CHILD-PUGHCLASS	SEX	
	FEMALE	MALE
A	4	20
B	0	45
C	20	11

63 patients have low TT3 level (i.e., <0.80), and 63 patients have averageTT3 level (i.e., 0.80-2.0). out of 24patients in Child Pugh class A, 22 patients have normal Total T3 levels, and 2

patients have low Total T3 levels. Out of 45 patients in Child- Pugh class B, 36 patients have low Total T3 levels, while 9 patients have normal levels. Out of 31 patients in Child-Pugh class C, 25 patients have low levels while only six patients have an average level as shown in Table 4. The coefficient of correlation between Total T3 level and Child-Pugh Score is 0.001.The correlation significance is 0.05

TABLE4:DISTRIBUTION OF PATIENTS ACCORDING TO TOTAL T3LEVEL AND CHILD PUGH SCORE

TOTAL T3 LEVEL	CHILD-PUGHCLASS			PVALUE
	A	B	C	
<0.80	2	36	25	<0.001
0.80-2.0	22	9	6	
>2.0	0	0	0	

Out of 100 patients, 82 patients (82%) had normal Total T4 level(i.e.,5.1-14.1),18 patients (18%) had low Total T4 level (i.e., <5.1) and none of the patients have high Total T4 level (i.e., >14.1).out o f24 patient in child Pugh classA,16 patients have normal Total T4 level while 8 patients have low Total T4 level. Out of 45 patients in Child Pugh class B, 5 patients have low Total T4 level while 40 patients have normal levels. Out of 31 patients in Child Pugh class C, 5 patients have low levels while 26 patients have normal levels of Total T4 as shown in Table 5. The coefficient of correlation between Total T4 Level and Child Pugh Score is 0.199 Correlation significance at 0.05

TABLE5:DISTRIBUTION OF PATIENTS ACCORDING TO TOTAL T4 LEVEL AND CHILD PUGH SCORE

TOTALT4LEVELS	CHILDPUGHCLASS			PVALUE
	A	B	C	
<5.1	8	5	5	0.199
5.1-14.1	16	40	26	
>14.1	0	0	0	

outof100 patients, 68 patients (68%) had Low Free T3 level (i.e., <2.7), 32 patients (32%) had Normal Free T3 level (i.e.,2.7-4.3) and none of the patients have high Free T3 level (i.e., >4.3).out of 24 patients in Child-Pugh class A, 12 patients had normal FreeT3levels,while the remaining 12 patients had low Free T3 levels. Of 45 patients in Child-Pugh class B, 32 patients have low Free T3 levels, while 13 have normal levels. Out of 31 patients in Child-Pugh class C, 24 patients have low levels, while 7 patients have average Free T3 level as shown in Table 6. The coefficient of correlation between Free T3Level and Child Pugh Score is 0.004. Correlation significance at0.05

TABLE6: DISTRIBUTION OF PATIENTS ACCORDING TO FREE T3AND CHILD PUGH SCORE

FREE T3 LEVEL	CHILD-PUGHCLASS			PVALUE
	A	B	C	
<2.7	12	32	24	0.004
2.7-4.3	12	13	7	
>4.3	0	0	0	

out of 100patients, 33 patients (33%) had Low Free T3 level (i.e., <0.9), 67 patients (67%) had Normal Free T4 level (i.e.,0-9-2.50) and none of the patients have high Free T4 level (i.e., >2.50).out of 24 patients in child Pugh class A, 21 patients have normal Free T4 levels while the remaining 3 patients have low Free T4 levels. Out of 45 patients in Child Pugh classB,19 patients have low Free T4 levels, while 26 patients have normal levels. Out of 31patients in Child-PughclassC,11patients have low levels,while20 patients have average Free T4 level as shown in Table 7. The coefficient of correlation between Free T4 Level and Child-Pugh Score is 0.052 Correlation significance at 0.05

TABLE7: DISTRIBUTION OF PATIENTS ACCORDING TO FREE T4 AND CHILD PUGH SCORE

FREET4LEVEL	CHILDPUGHCLASS			PVALUE
	A	B	C	
<0.9	3	19	11	
0.9-2.50	21	26	20	
>2.50	0	0	0	0.052

Out of 100patients, 36 patients (36%) had normal TSH level (i.e.,0.27-4.20), 64 patients (64%) had High TSH level(i.e.,>4.20) and none of the patients have Low TSH level (i.e.,<0.27).out of 24 patients in Child-Pugh class A, 21 patients have normal TSH levels, while the remaining 3 patients have high TSH levels. Out of 45 patients in Child- Pugh class B, 35 patients have high TSH levels, while 10 patients have normal TSH levels. Out of 31 patients in Child Pugh class C, 26 patients have High TSH levels while 5 patients have normal TSH level as shown in Table 8.The coefficient of correlation between TSH Level and Child Pugh Score is <0.001 Correlation significance at 0.05

TABLE8:DISTRIBUTION OF PATIENTS ACCORDING TO TSH LEVEL AND CHILD PUGH SCORE

TSHLEVEL	CHILDPUGHCLASS			PVALUE
	A	B	C	
<0.27	0	0	0	
0.27-4.20	21	10	5	<0.001
>4.20	3	35	26	

DISCUSSION:

Chronic liver disease (CLD) is a progressive condition that significantly impacts various physiological systems, including the endocrine system. The intricate relationship between liver function and thyroid hormone metabolism necessitates a comprehensive understanding of how thyroid dysfunction correlates with the severity of liver disease. This study investigates the distribution of thyroid function tests among patients with varying degrees of CLD, classified using the Child-Pugh score, to elucidate these associations.

IMPACT OF AGE ON ALTERED THYROID FUNCTION IN CLD:

In our study, the age dispersion demonstrated that the majority(29%)were in the31–40 arrrange, followedby26%inthe41-50agerange. This distribution highlights that middle-aged adults are predominantly affected by CLD. Kharb et al. [7] observed in their research in liver disorders on thyroid and gonadal function that middle-aged and elderly people, were more likely to have thyroid dysfunctions. Targher et al. [8] indicated that elderly people, were more likely to have thyroid dysfunctions. Bernardietal. [9]found that older age groups exhibited a higher prevalence of thyroid dysfunction, Joeimon et al. [10] noted that thyroid dysfunction, particularly low T3 and elevated TSH levels, was common among patients with liver cirrhosis, predominantly affecting older adults.

IMPACT OF GENDER ON ALTERED THYROID FUNCTION IN CLD

In the study we conducted amongst 100 patients with chronic liver disease(CLD), 76% were males, and 24% were females, indicating a higher prevalence of CLD among males. Which was similar to the studies of Kharb et al. [7], Kayacetin etal.[11] &Huang et al. [12]

CORRELATION OF THE T3 LEVELS AND SEVERITY OF CLD:

In our study 63% of patients have low TT3 levels and 68% have low FT3 levels. Bernardi et al. [9] found a significant proportion of cirrhosis patients had low TT3 and FT3 levels, Kharb et al. [7] observed that patients with liver disease frequently exhibited low TT3 and FT3 levels and elevated TSH levels. Joeimon JL et al. [10] identified a significant prevalence of low FT3and elevated TSH levels among cirrhotic patients. Mobin A et al. [13] Found that decompensated cirrhosis patients commonly had low FT3 levels and high TSH levels. Deepika G. et al. [14] in their study they reported a high prevalence of low TT3 and FT3 levels in cirrhotic patients. Our study's results of 63%with low TT3levels and 68% with low FT3 levels agree with Deepika et al.'s findings. Borzio et al. [15] found multiple abnormalities in thyroid function tests in patients with chronic liver disease, including alterations in both Total T3 and Free T3 levels. Bernardi et al. [9] discussed the "low T3 syndrome" in cirrhosis, noting that the severity of liver disease correlated with more pronounced reductions in Total T3 and Free T3 levels. Joeimon et al. [10] Reported thyroid dysfunction, particularly hypothyroidism, in liver cirrhosis patients. They found that low T3 levels were prevalent in patients with more severe live rdisease, Huangetal. [12] found that low free tri iodo thyronine levels were associated with poor prognosis in portal hypertension in cirrhosis.

CORRELATIONOFT4LEVELSANDSEVERITYOFCLD:

In our study it was observed that as liver disease progresses, as reflected in higher Child-Pugh scores, the likelihood of having lower Total T4 and free T4 levels increases. Patira et al. [16] found that patients with more severe cirrhosis (Child-Pugh Class C) had significantly lower Free T4 levels (mean Free T4: 0.75 ng/dL) Mobinetal. [13]reported that thyroid hormone levels, particularly low T3 andT4, were prevalent in severe liver disease. Liuetal. [17] observed that Low Free T4 levels (<0.8 ng/dL) were significantly associated with higher Child-Pughscores. Punekar et al. [18]reported that 60% of patients in Child-Pugh Class C had low Free T4 levels. Borzio et al. [15]reported that many cirrhotic patient shad low Total T4 and T3levels.Targher et al. [8]high lighted that thyroid dysfunction, including altered TSH and free T4 levels, was prevalent in patients with elevated liver enzymes.

CORRELATIONOFTSHLEVELSANDSEVERITYOFCLD:

Our study found that elevated TSH levels were significantly associated with higher Child-Pugh scores..Huang et al. highlighted that as liver disease progresses, thyroid dysfunction becomes more pronounced, Patira et al. [16] discovered that advanced cirrhosis was substantially correlated with increased TSH levels, especially in Child-Pugh Class C subjects Mobinetal. [13] studied Patients with decompensated cirrhosis had their thyroid hormone levels examined, and it was shown that 60% of these patients had elevated TSH levels. Liu et al. [17] found that elevated TSH levels were significantly associated with higher Child-Pugh scores.

CONCLUSION:

The findings of the study highlight the importance of regular thyroid function monitoring in assessing and managing CLD patients. Additionally, the significant gender disparities observed in disease severity emphasize the need for gender-specific approaches in CLD management. These insights can guide more effective clinical interventions and improve patient out comes in chronic liver disease.

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