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Proportion And Patterns Of Thyroid Dysfunction In Patients With Chronic Liver Disorders At a Tertiary Care Hospital

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ABSTRACT

Background: Chronic liver disease and thyroid dysfunction are common conditions that often coexist. This study aimed to investigate the prevalence and patterns of thyroid dysfunction in patients with chronic liver disorders at a tertiary care hospital.

Methods: This cross-sectional study recruited 120 patients aged over 18 years with chronic liver disease, excluding those with known thyroid disorders or critical illnesses. Thyroid profile (T3, T4, TSH) and liver function tests were performed. Thyroid dysfunction was determined based on established cut-offs. Data were analysed using descriptive statistics and correlation analysis.

Results: The prevalence of thyroid dysfunction in patients with chronic liver disease was 51.7%. Hypothyroidism was seen in 29.2% (subclinical 20.8%, overt 8.3%), hyperthyroidism in 10.8% (subclinical 7.5%, overt 3.3%), and euthyroid sick syndrome in 11.7%. Hypothyroidism was common in alcoholic liver disease (48.6%), and hyperthyroidism was common in viral hepatitis and alcoholic liver disease (46.2% each). Thyroid dysfunction was associated with advanced Child-Pugh scores. A negative correlation was observed between thyroid hormones (T3, T4, TSH) and liver parameters like bilirubin, ALT, AST, and albumin.

Conclusion: Thyroid dysfunction, particularly hypothyroidism, is highly prevalent in patients with chronic liver disease. The patterns of thyroid dysfunction correlate with the aetiology,

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severity, and complications of liver disease. Regular thyroid screening and appropriate management may improve outcomes in this patient population.

Keywords: Chronic liver disorder, thyroid dysfunction, prevalence, liver function tests.

INTRODUCTION

Both chronic liver disease and thyroid abnormalities are common illnesses that frequently coexist in patients. Chronic liver disease is defined as long-term damage and inflammation of the liver, which can be caused by hepatitis B or C virus infection, alcohol addiction, non-alcoholic fatty liver disease, or autoimmune liver disease.[1] Thyroid illnesses, on the other hand, are caused by dysfunction in the thyroid gland, which produces thyroid hormones. Common thyroid disorders include hypothyroidism, hyperthyroidism, and goitre, Hashimoto's thyroiditis and thyroid cancer.[2]

Several studies have found a link between chronic liver disease and changes in thyroid hormone levels. Cirrhotic people, for example, are more likely to develop hypothyroidism or sick euthyroid syndrome. The latter is characterised by abnormal thyroid hormone levels but no thyroid related symptoms.[3]

The prevalence of hypothyroidism in chronic hepatitis C patients has been observed to range between 4 and 9%.[4] On the other hand, non-alcoholic fatty liver disease development has been connected to hyperthyroidism.[5] The mechanisms behind the link between chronic liver disease and thyroid dysfunction are not entirely understood. Possible causes include impaired thyroid hormone clearance in the liver, changes in binding proteins, hepatitis C virus impacts, malnutrition, and comorbidities.[6]

The purpose of this study is to investigate the relationship between chronic liver disease and thyroid function at a tertiary care hospital. The findings will help to clarify the nature and extent of thyroid abnormalities in chronic liver disease patients. This can help in the early detection and therapy of thyroid dysfunction in chronic liver disease patients, who are already at a higher risk of comorbidities. We hypothesise that chronic liver disease will result in a higher prevalence of abnormal thyroid function tests than the general population.

MATERIALS AND METHODS

The present hospital based cross-sectional study was conducted at department of Medicine, S.Nijalingappa medical college and hospital, Bagalkot after obtaining institutional ethics committee approval.

Inclusion criteria

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Patients aged more than 18 years of age with chronic liver disease, including viral hepatitis, alcoholic liver disease, non-alcoholic fatty liver disease, autoimmune liver disease**.**

Exclusion criteria

1) Patients who were known case of thyroid disorder
2) Patients on thyroid supplements or antithyroid medications.
3) Patients on medications influencing thyroid function.
4) Pregnant women
5) Patients having critical illnesses.

Open Epi was used for calculating sample size. According to a study done by Chaudary S et al[7], the prevalence of thyroid dysfunction in chronic liver disease was 39.1%. Considering the prevalence as 39.1% and 20% precision, the sample size calculated to be 112 which was inflated to 120 using the formula,

n= [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)]

Relevant information was obtained from eligible individuals' medical records, including demographics, liver disease profile, Child-Pugh/MELD scores, medications, and comorbidities. Blood samples were taken to test the thyroid profile (T3, T4, and TSH). Liver function tests were also performed. Thyroid dysfunction was determined using established cut-offs for TSH, T3, and T4 values.

Data analyses were performed using statistics package programme SPSS (Statistical Package for Social Sciences ver.20). Descriptive variables for continuous and discrete data were expressed as mean± standard deviation (SD) and median while categorical variables were expressed as numbers and percent (%). Categorical variables were analysed with Pearson's Chi-Square Test or Fisher's Exact Test. p values lower than 0.05 were interpreted as statistically significant.

RESULTS

The prevalence of thyroid dysfunction in patients with chronic liver disease was 51.7%. Hypothyroidism was seen in 29.2% of the patients (subclinical -20.8%, overt-8.3%) and hyperthyroidism was seen in 10.8% of the patients (subclinical-7.5%, overt-3.3%) and 11.7% of the patients presented with sick euthyroid syndrome. (11.7%). **(Table 1)**

Table 1: Prevalence of thyroid dysfunction.

Thyroid dysfunction	Prevalence, N (%)

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Hypothyroidism	35 (29.2%)
Subclinical hypothyroidism	25 (20.8%)
Overt hypothyroidism	10 (8.3%)
Hyperthyroidism	13 (10.8%)
Subclinical hyperthyroidism	9 (7.5%)
Overt hyperthyroidism	4 (3.3%)
Sick euthyroid syndrome	14 (11.7%)
Total	**62 (51.7%)**

Hypothyroidism (42.9%) and sick euthyroid (42.9%) was commonly seen in >60 years of age and majority of the patients with hyperthyroidism was most common in 41-60 years of age (46.2%). All the patterns of thyroid dysfunction such as hypothyroidism (62.9%), hyperthyroidism (61.5%) and euthyroid (57.1%) were most common among males compared to females. Hypothyroidism was most common in patients with alcoholic liver disease (48.6%) and hyperthyroidism was commonly seen in patients with viral hepatitis and alcoholic liver disease (46.2%) and sick euthyroid was common in patients with NAFLD (50%) and the association was statistically significant when chi-square test was applied ($p<0.05$). **(Table 2)**

Hypothyroidism was common among patients with class B (42.9%) and class C (42.8%) and hyperthyroidism most commonly seen in patients with class C (46.2%) and sick euthyroid was common in class A (57.1%) and the association was statistically significant when chi-square test was applied ($p<0.05$). **(Table 2)**

The most common complication in patients with chronic liver disease with hypothyroidism and hyperthyroidism was ascites (25.7%) and most common complication in patients with chronic liver disease with sick euthyroid was hepatic encephalopathy (14.3%) and the association was statistically significant when chi-square test was applied ($p<0.05$). Mortality was most common among patients with hyperthyroidism (30.8%). **(Table 2)**

Table 2: Association Of Thyroid Dysfunction With Different Variables.

Variables	**Thyroid dysfunction**			**P value**
	Hypothyroidism	**Hyperthyroidism**	**Sick euthyroid**	
Age (in years)				
<40	7 (20%)	2 (15.4%)	3 (21.4%)	

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41-60	13 (37.1%)	6 (46.2%)	5 (35.7%)	>0.05
>60	15 (42.9%)	5 (38.5%)	6 (42.9%)	
Gender				
Male	22 (62.9%)	8 (61.5%)	8 (57.1%)	
Female	13 (37.1%)	5 (38.5%)	6 (42.9%)	>0.05
Etiologies				
Viral hepatitis	14 (40%)	6 (46.2%)	3 (21.4%)	
Alcoholic liver disease	17 (48.6%)	6 (46.2%)	4 (28.5%)	**<0.05**
NAFLD	4 (11.4%)	1 (7.6%)	7 (50%)	
Child-Pugh scores				
A (5-6)	5 (14.3%)	4 (30.7%)	8 (57.1%)	
B (7-9)	15 (42.9%)	3 (23.1%)	5 (35.7%)	**<0.05**
C (10-15)	15 (42.8%)	6 (46.2%)	1 (7.2%)	
Complications				
Ascites	9 (25.7%)	7 (53.8%)	1 (7.1%)	**<0.05**
Hepatic encephalopathy	6 (17.1%)	2 (15.4%)	2 (14.3%)	**<0.05**
Mortality	9 (25.7%)	4 (30.8%)	2 (14.3%)	>0.05

There seems to be a negative correlation between T3 and liver parameters such as bilirubin, ALT, AST and albumin and correlation was significant with all the parameters ($p<0.05$). Negative correlation between T4 and liver parameters was seen and the correlation was not significant. Negative correlation between TSH and liver parameters was seen and the correlation was significant with only with bilirubin and AST ($p<0.05$). **(Table 3)**

Table 3: Correlations Between Thyroid Hormone Levels And Liver Function Test Parameters.

Parameters	T3	T4	TSH
Bilirubin (mg/dl)	r= -0.32, p=0.001	r= -0.18, p=0.07	r= -0.25, p=0.01
ALT (U/L	r=-0.22, p=0.03	r=-0.11, p=0.27	r=-0.19, p=0.06
AST (U/L)	r= -0.29, p= 0.03	r= -0.16, p= 0.11	r= -0.21, p= 0.04
Albumin (gm/dL)	r= -0.26, p=0.01	r= -0.14, p=0.16	r= -0.18, p=0.07

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DISCUSSION

The present cross-sectional study was done to determine the proportions and patterns of thyroid dysfunction in patients with chronic liver disorders at a tertiary care hospital.

The overall prevalence of thyroid dysfunction in patients with chronic liver disease in the present study was 51.7%. The most common thyroid dysfunction seen was hypothyroidism (29.2%) and hyperthyroidism was seen in 10.8% of the patients and sick euthyroid was seen in 11.7% of the patients. A similar result was seen in the study done by Desai Y et al[8] where the frequency of thyroid dysfunction among patients with chronic liver disease was 36.5% and the most frequent thyroid dysfunction was subclinical hypothyroidism (21.2%), followed by low T3 syndrome (9.6%). In contrast to our study, Kharb S et al[9] showed 16% of the patients had thyroid malfunction, with sick euthyroid syndrome being the most common type (7%).

Our study found that hypothyroidism (42.9%) and sick euthyroid (42.9%) was commonly seen in >60 years of age and majority of the patients with hyperthyroidism was most common in 41-60 years of age (46.2%). The study done by Kalmani VM et al[10] showed that hypothyroidism was most common among 45-60 years of age (40%) and euthyroid was seen in commonly in 25-45 years of age (68.5%).

In our study, all the patterns of thyroid dysfunction such as hypothyroidism (62.9%), hyperthyroidism (61.5%) and sick euthyroid (57.1%) were most common among males compared to females which is similar to the study done by Desai Y et al[8] where thyroid dysfunction was most common among males (40.5%).

Our study depicted that hypothyroidism was most common in patients with alcoholic liver disease (48.6%) and hyperthyroidism was commonly seen in patients with viral hepatitis and alcoholic liver disease (46.2%) and sick euthyroid was common in patients with NAFLD (50%) whereas the study done by Desai Y et al[8] showed that thyroid dysfunction was common among patients with hepatitis B (41.2%) and alcoholic liver disease (37.9%) which is similar to our study .The other studies like Verma SK et al[11] observed In patients with liver cirrhosis, low free T3 and T4 were found in 72.5% and 26.47% of cases, respectively. Punekar P et al.[12] found that patients with liver cirrhosis had statistically significant lower levels of FT3 ($P < 0.0001$) and FT4 ($P < 0.0001$) but higher levels of TSH ($P < 0.0001$) when compared to the control group. Similar findings were observed in a study by PS Mukherjee et al.[13], where hepatitis B was the second most prevalent cause of cirrhosis (33.3%), with alcohol being the most common cause (33.9%). Compared to our research, Choudhuri G et al[14]'s findings

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indicated that nonalcoholic fatty liver disease accounted for 39.7% of cases, with alcoholic liver disease coming in second at 25.6%.

Our study presented that hypothyroidism was common among patients with class B (42.9%) followed by class C (42.8%). Hyperthyroidism most commonly seen in patients with class C (46.2%) and sick euthyroid was common in class A (57.1%) of Child-Pugh scores. A similar observation was seen in the study done by Desai Y et al[8] where for Child-Pugh scores in grades A, B, and C, the prevalence of thyroid dysfunction was 11.1%, 42.9%, and 55%, respectively ($p<0.05$). According to another study by Joeimon JL et al[15], out of the 24 patients with hypothyroidism, five belonged to Child Pugh A (out of 28 i.e., 17.8%), 11 to Child Pugh B (out of 53 i.e. 20.7%), and eight to Child Pugh C (out of 30 i.e. 26.6%). Similarly, Verma SK et al[11] found that low free T3 and free T4 were inversely related to the severity of liver disease.

The most common complication in our study in patients with chronic liver disease with hypothyroidism and hyperthyroidism was ascites, 25.7% and 53.8% respectively. Most common complication in patients with chronic liver disease with sick euthyroid was hepatic encephalopathy (14.3%) which is similar to the study done by Kalmani VM at al[10] where hepatic encephalopathy was seen in 29% of the patients with thyroid dysfunction. The findings reported in our investigation are consistent with and well supported by other studies, such as those by P Punekar et al[12] and Kharb S et al[9].

The present study found that there seems to be a negative correlation of T3, T4 and TSH with liver parameters such as bilirubin, AST, ALT and albumin whereas in a study done by Yadav et al[16] where TSH showed significant positive correlation with AST and ALP values, whereas FT3 and FT4 had a negative correlation with AST in overt hypothyroidism. Another study done by Punekar et al[12] reported that FT3 and FT4 were negatively correlated but TSH levels were positively correlated with total leukocyte counts, bilirubin, AST and ALT.

CONCLUSION

In conclusion, the findings revealed a significant negative correlation between T3, T4 and TSH levels and liver parameters such as bilirubin, ALT, AST, and albumin, highlighting the potential impact of thyroid dysfunction on hepatic function. These results contribute to the growing body of evidence on thyroid dysfunction in the context of liver diseases, emphasizing the need for tailored management strategies that consider both thyroid function and liver health. Further research is warranted to explore the underlying mechanisms driving these correlations and to elucidate the clinical implications for patient care. By understanding the prevalence and

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patterns of thyroid dysfunction in patients with chronic liver disorders, healthcare providers can optimize treatment approaches and improve outcomes for this vulnerable patient population.

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