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A study of association between chronic liver disease and thyroid function tests at a tertiary care hospital in Western Uttar Pradesh

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ABSTRACT

Background: One of the many functions of the liver is the synthesis of carrier proteins and hormone metabolism, and liver diseases have been linked to a variety of endocrine disorders**. Aim:**The study's goal was to look at the spectrum of chronic liver disease and the relationship between thyroid profile and severity of liver damage in a tertiary hospital. **Methods and materials**: The current study was a single-center, tertiary care hospital-based,case-control study that included 50 cases of liver cirrhosis/chronic liver disease and 50 age/sex matched healthy controls (chosen at random from relatives attending OPD with patients). Thyroid function tests were performed and results were compared between cases and controls.**Result :** This study included 50 cases of liver cirrhosis/chronic liver disease and 50 healthy controls.The mean age and gender of cases and controls were comparable, and the difference was not statistically significant. The majority of cases (76%) had alcoholic liver cirrhosis, with the remainder having non-alcoholic liver cirrhosis (16%) and chronic viral hepatitis (8%). As per Child-Pugh Score, the majority of cases (40%), followed by Child-Pugh C (32%) and Child-Pugh A (28%). In the current study, free T3, free T4, and TSH levels were compared between cases and controls, and abnormal values were found in cases, indicating a statistically significant difference. Serum thyroid profile abnormalities were observed as Child-Pugh Score Classes advanced, and the difference was statistically significant for free T3 and free T4.

Conclusion:

As compared to healthy subjects, patients with liver cirrhosis had abnormally high levels of circulating thyroid hormone, and severe abnor malitieswere linked to an advanced Child Pugh score. Derangement in thyroid profile is common in patients with cirrhosis of liver. Low free T3 and T4 levels are associated with more severe liver injury and may be used for prognostication in patients with cirrhosis of liver.

Keywords: chronic liver disease; NAFLD, cirrhosis, Liver function tests; Free T3 and T4; TSH;

Introduction

The liver and thyroid are closely related organs. Hepatocytes' basal metabolic rate is regulated by thyroid hormones, and dysthyroidism can affect how bilirubin is metabolised and how the blood flows through the liver .The severity of hyperthyroidism is a risk factor for abnormal liver function tests, according to earlier research that found a link between the condition and liver disease . Aspartate aminotransferase (AST) levels and elevated mean thyroid-stimulating hormone (TSH) levels have been linked in previous studies to patients with liver cirrhosis when compared to healthy controls . This association can be explained by the progressive fat accumulation and alteration in lipid metabolism, which are caused by thyroid dysfunction.Oxidative stress and lipid peroxidation are other causes of liver cell damage, and this is due to excessive secretion of TSH .Several studies have reported a strong correlation between liver disease and thyroid dysfunction in individuals with non-alcoholic fatty liver disease (NAFLD) .Subclinical hypothyroidism, characterized by an elevated serum TSH level and normal thyroxine (T4) levels, is considered benign in most cases. However, its effect on the liver is similar to that of overt hypothyroidism, and progression to overt hypothyroidism is possible . Aim of the study was to evaluate the spectrum of chronic liver disease and association between thyroid profile and severity of liver damage at a tertiary care hospital.

MATERIAL AND METHODS

This study was single-center, Tertiary care hospital, based, case control study, conducted in department of medicine with help from department of biochemistry at School of medical sciences & research, sharda university,Greater Noida ,UP, India. Study duration was of 6 month (July 2022 to Dec 2022). 50 cases and 50 age/sex matched healthy controls (randomly selected from relatives attending OPD with patients) were studied.

Inclusion criteria for cases:

1.Patients > 18 years
2.presented with liver cirrhosis/ chronic liver disease

Exclusion criteria for cases:

1.Pragnancy
2.Patients who refused to give consent.
3.Previously known thyroid disease, diabetes, nephritic syndrome renal failure or any other acute or chronic illnesses.
4.Patient receiving drugs that may interfere with thyroid hormone metabolism and function like amiodarone, phenytoin, beta blockers, steroids, estrogen and iodine containing drugs/contrast.

Aim

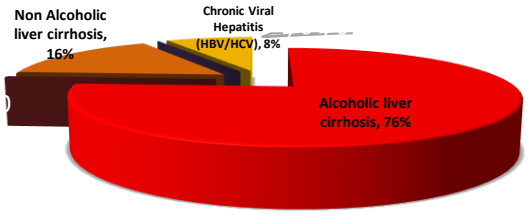
Aim of the study was to evaluate the spectrum of chronic liver disease and association between thyroid profile and severity of liver damage at a tertiary care hospital.

Statistical analysis

All the data will be entered in the proforma and analysed using SPSS v21 operating on windows 10. The descriptive analysis will be used to summarise as frequency, percentage, proportion, mean and standard deviation. The statistical difference between the categorical variable will be analysed using the analysis of variance(Anova) /chi-square test.A p-value of 0.05 will be considered statistically significant.

RESULT

In present study 50 cases of liver cirrhosis/ chronic liver disease and 50 healthy controls were studied.



Mean age and gender were comparable in cases and controls and difference was not statistically significant. 76 % of cases had cirrhosis of the liver caused by alcohol consumption, 16 % by non-alcohol consumption, and 8% by chronic viral hepatitis. According to the Child-Pugh Score, Child-Pugh B accounted for the majority of cases (40%), followed by Child-Pugh C (32%) and Child-Pugh A (28%).

General information	Case (n=50)	Control(n=50)	p-Value
Mean Age	51.5 ± 13.7	52.1 ± 15.7	0.72
Gender			0.82
Male (n %)	40 (80.0 %)	39 (78 %)	
Female (n %)	10 (20.0 %)	11 (22 %)	
Diagnosis			
Alcoholic liver cirrhosis 38 (76 %)			
Non-alcoholic liver cirrhosis 8 (16 %)			
Chronic Viral Hepatitis (HBV/HCV) 4 (8 %)			

Classification according to Child-Pugh Score

Child-Pugh A	14 (28 %)
Child-Pugh B	20 (40 %)
Child-Pugh C	16 (32 %)

In present study free T3 , free T4 and TSH were compared between cases and controls, abnormal values werenoted in cases and statistically significant difference was noted.

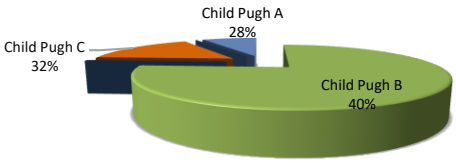
Comparison of Serum thyroid profile

	Reference range	Cases (n=50)	Controls (n=50)	P-Value
Free T3 (pg/ml)	2.3 - 4.1	1.86 ± 0.62	2.87 ± 0.56	< 0.001
Free T4 (ng/dl)	0.9 - 1.7	0.62 ± 0.49	1.29 ± 0.81	< 0.001
TSH (mIU/ml)	0.3-4.5	0.93 ± 1.26	3.23 ± 2.35	< 0.001

DISCUSSION

The liver plays a central role in thyroid hormone metabolism, transport, and clearance by producing thyroid binding globulin, albumin and transthyretin. Alcohol is the leading cause of cirrhosis in India (34.3%), accounting for almost 20% of all liver disease patients.

Alcohol may also be a significant contributor to a sizable portion of liver-related mortality that has no known cause. Hepatic fat accumulation in the absence of hereditary and autoimmune conditions, drug-induced liver injury, alcohol consumption, or viral aetiology is the definition of non-alcoholic fatty liver disease **(NAFLD)**. Over the past few decades, there has been a marked rise in the prevalence of NAFLD; this development may be attributed to genetics, obesity, unhealthy lifestyle choices, and other metabolic risk factors.[1] The low total and FT3 levels may be regarded as an adaptive hypothyroid state that serves to reduce the basal BMR within hepatocytes and preserve liver function and total body protein stores. Ashish Kumar et al.[2] studied 50 patients, (35 males and 15 females, male to female



ratio of 2.33) with liver cirrhosis. 21 patients had alcoholic liver disease, 20 had Hepatitis C, 5 had hepatitis B and 4 patients had cryptogenic cirrhosis. On assessment of severity of cirrhosis 26 patients belonged to CTP A, 19 to CTP B and 5 to CTP C. Subclinical hypothyroidism was seen in 5 out of 50 patients (10 %) and hyperthyroidism was observed in 2 cases (4%). Among the patients with hypothyroidism, 3 had ethanol related liver cirrhosis, 1 had Hepatitis C whereas 1 had cryptogenic cirrhosis. Two Patients with hyperthyroidism belonged to CTP A; one had cryptogenic cirrhosis and one has hepatitis C. High incidence of abnormalities in circulating thyroid hormone concentrations i.e. hypothyroidism is noted especially in those with ethanol related liver cirrhosis and it is associated with more advanced liver disease. Punekar et al.[4] noted that males (71%) were involved more than female.

Chaudhary S et al.[3] studied 110 patients with liver cirrhosis and 110 healthy controls, mean age of patients was 51.1±12.13 years and Male : Female ratio of 4:1. According to Child Pugh score (CPS) 62 (56.36%) patients were in Class C, 35 (31.82 %) patients were in Class B. Low level of FT3 was seen in 27 (24.6%) patients, low level of FT4 was in 11 (10 %) patients and high TSH level was seen in 25 (22.7 %) patients.Similar findings were noted in this study. Free T3 correlated significantly with GGT before and after therapy, but free T4 and TSH correlated significantly with GGT after treatment. Thyroid hormone levels, particularly free T3 and free T4, should be monitored in patients with chronic alcoholic liver disease, as well as during withdrawal and abstinence periods, because low hormone levels

can exacerbate withdrawal symptoms and increase demand for alcohol.

He W et al.,5 did a meta-analysis and discovered substantial epidemiological evidence between hypothyroidism with nonalcoholic fatty liver disease (NAFLD). Individuals with both subclinical and overt hypothyroidism are more likely to develop NAFLD than euthyroid people. It is critical to understand the relationship between hypothyroidism and abnormal biochemical indicators of liver function. In the workup of the patient with abnormal liver function tests, the doctor should consider an examination of thyroid function. The current study had some limitations, including a single site, a limited sample size, and the diagnosis of cirrhosis was not verified histopathologically in each patient.

CONCLUSION

Thyroid function test abnormalities in circulating thyroid hormone concentrations were discovered in the patients' liver. Cirrhosis was related with a higher Child Pugh score when compared to healthy patients, while severe abnormalities were associated with a adavanced Child Pugh score.

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