



Relation Between Hypothyroidism And Non-Alcoholic Fatty Liver Disease

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Abstract

Background: Non-alcoholic fatty liver disease (NAFLD) represents a broad clinical spectrum ranging from simple steatosis to non-alcoholic steatohepatitis (NASH), which may progress to liver fibrosis, cirrhosis and hepatocellular carcinoma. Importantly thyroid hormones interact on hepatic lipid homeostasis through multiple pathways including stimulation of free fatty acid delivery to the liver for re-esterification of triglycerides, and increasing fatty acid Beta-oxidation thereby affecting hepatic fat accumulation. Early identification of at-risk patients is important since treatment of the hypothyroidism may reduce the risk of NAFLD and its potential complications. Hence our aim is to study the relationship between Hypothyroidism and Non-Alcoholic Fatty Liver Disease.

Methods: This is a Cross sectional study consisting of 50 patients with Hypothyroidism who are enrolled for the study at Institute of Internal medicine, Madras Medical College. Patients with Hypothyroidism and aged more than 18 years were included and those patients with BMI more than 30, Diabetes Mellitus, Dyslipidemia, Alcohol intake more than 20g/day and also patients with Hepatitis B, Hepatitis C and HIV Positive were excluded from the study. **Results:** In this study 10% of patients showed fatty liver. Fibroscan was done for them, it has showed no significant fibrosis. Around 87% patients with fatty liver had TSH more than 60. Hypothyroid patients with anaemia had higher incidence of fatty liver in our study.

Conclusion: Hypothyroidism is an independent risk factor for NAFLD. So NAFLD screening is mandatory for all the patients with Hypothyroidism. Early treatment of hypothyroidism may help in reducing progression and complications of NAFLD.

Keywords: Hypothyroidism, NAFLD

Introduction

Nonalcoholic fatty liver disease (NAFLD) represents a broad clinical spectrum ranging from simple steatosis to nonalcoholic steatohepatitis (NASH), which may progress to liver fibrosis, cirrhosis and hepatocellular carcinoma.¹ NAFLD is a rapidly growing diagnosis and it is the most common cause for abnormal liver function test worldwide.² Advanced age and metabolic disorders like Type 2

diabetes, impaired glucose tolerance, and central obesity are among the risk factors for NAFLD.³

NAFLD incidence increasing especially in developed and developing countries, it is anticipated that cirrhosis due to these conditions may surpass other causes of cirrhosis in a near future. Therefore understanding the pathophysiology risk factors and new treatment options of NAFLD should be among the priorities in the field of hepatology.

The thyroid gland is significantly involved in energy homeostasis, lipid and carbohydrate metabolism, regulation of body weight and adipogenesis.⁴ In a clinical setting, subclinical hypothyroidism has been associated with metabolic syndrome, cardiovascular mortality and disturbance of lipid metabolism⁵. In recent years, growing body of evidence has led to speculation on the association between NAFLD and thyroid dysfunction. Importantly thyroid hormones interact on hepatic lipid homeostasis through multiple pathways including stimulation of free fatty acid delivery to the liver for re-esterification of triglycerides, and increasing fatty acid Beta-oxidation thereby affecting hepatic fat accumulation. Early identification of at-risk patients is important since treatment of the hypothyroidism may reduce the risk of NAFLD and its potential complications.⁶. Based on this Aim of our study is to evaluate the relationship between Hypothyroidism and Non-Alcoholic Fatty Liver Disease.

Material And Methods

The study was done as Cross-sectional study, Patients with Hypothyroidism are enrolled for the study at Institute of Internal medicine, Madras Medical

College & Rajiv Gandhi Government General Hospital from January 2020 to September 2021. Patients with Hypothyroidism aged more than 18 years are enrolled for the study. Those patients with BMI more than 30, Diabetes Mellitus, Dyslipidaemia, Alcohol intake more than 20g/day and also patients with Hepatitis B, Hepatitis C and HIV Positive were excluded from the study.

A questionnaire was prepared which include symptoms like weight gain, fatigue, constipation, cold intolerance, dry skin, hair changes, voice changes, menstrual irregularities were asked. Past medical, surgical history & personal history like alcohol intake and drug history were elicited. Physical examination and systemic examination were conducted Blood investigation and USG Abdomen were done. Those who showed positive for fatty liver were subjected to fibro scan to study the stage of NAFLD.

Results And Analysis

In this study 10% of patients showed fatty liver. Fibro scan was done for them, it has showed no significant fibrosis.

Table 1: Incidence of fatty liver

USG ABDOMEN	Frequency	Percent
Fatty liver	5	10.0
Normal	45	90.0
Total	50	100.0

Among the 10% of the patient with fatty liver 40% were in the age group of 20 to 30 years, 40% were in the age group of 41 to 50 years and the remaining 20% were above 50 years. Pearson Chi square was 4.561 and P value showed 0.207 which is not significant. So there is no significance between age and fatty liver in patients suffering from Hypothyroidism. Fatty liver was observed in 11% of female patients but none of the male patients showed fatty liver. Pearson Chi Square was 0.483 and P value showed 0.487 which is not significant. So there is no significant relationship between sex and NAFLD in patients with Hypothyroidism.

In our study 11% of patients with low free T3 and free T4 had fatty liver and none of the patients with normal free T3 and free T4 showed fatty liver in our study. Pearson Chi Square was 0.758 and P value showed 0.384 for both T3 and T4, which is not significant. So there is no significance between T3 & T4 level and fatty liver in patients with Hypothyroidism.

From this study, it has been observed that there is high incidence of fatty liver in patients whose TSH level more than 60. Around 87% patients with fatty liver had TSH more than 60. The value was calculated for the relationship which came to be less than 0.001 which is significant. Hypothyroid patients

with anaemia had higher incidence of fatty liver in our study.

Around 22% of patients with low haemoglobin had fatty liver and none of the patients with normal haemoglobin showed fatty liver. Pearson Chi Square was 6.522 and P value was 0.011 which is significant. So there is a significant relationship between haemoglobin level and NAFLD in patients with Hypothyroidism. Hypothyroid patients diastolic BP of more than or equal to 90 showed fatty liver more than that of Hypothyroid patients with diastolic BP of less than 90. Around 60% patients with fatty liver had diastolic BP more than or equal to 90. The value was calculated for the relationship which came to be less than 0.005 which is significant

Discussion:

In this study 10% of patients showed fatty liver. Fibroscan was done for them, it has showed no significant fibrosis. 11% of patients with low free T3 and free T4 had fatty liver and none of the patients with normal free T3 and free T4 showed fatty liver in our study. Pearson Chi Square was 0.758 and P value showed 0.384 for both T3 and T4, which is not significant. So there is no significance between T3 & T4 level and fatty liver in patients with Hypothyroidism. The more significant correlation between overt hypothyroidism and NAFLD may be explained by the synergistic effects of higher TSH level and lower thyroid hormones in the pathogenesis of NAFLD, because TSH itself may induce hepatocyte steatosis *via* TSH receptor signal⁷

Iron deficiency is prevalent in patients with NAFLD and associated with female sex, increased body mass index, and non-white race. Serum levels of hepcidin were lower in iron-deficient subjects, reflecting an appropriate physiological response to decreased circulating levels of iron, rather than a primary cause of iron deficiency in the setting of obesity and NAFLD⁸.

Similar to our study Previous studies propose that hypothyroidism might play a crucial role in the pathogenesis of NAFLD. Some studies report that the prevalence of hypothyroidism is from 15.2 to 36.3% among patients with NAFLD, indicating that hypothyroidism is a common concomitant disease of NAFLD and may be related to the development of NAFLD.⁹

There are several possible mechanisms which can explain the relationship between hypothyroidism and NAFLD. First, obvious relations between hypothyroidism and metabolic changes have been reported, which include IR, dyslipidaemia and obesity and they have important roles in the development of NAFLD¹⁰. Both IR and obesity are vital factors in the development of NAFLD, which are also common in hypothyroidism patients compared to those general population. IR can accelerate liver injury in NAFLD¹¹.

Besides, Demir et al. found that hypothyroidism can cause NAFLD in rat models, and pointed out that obesity is one of the key factors in the relationship between hypothyroidism and NAFLD (29). The metabolic changes aforesaid among hypothyroidism patients can thus further result in the development of NAFLD¹⁰.

Second, thyroid hormones can regulate lipid metabolism in the liver *via* thyroid hormone receptor β , and they can decrease cholesterol and triglyceride levels¹². It is worth mentioning that lower levels of thyroid hormones in hypothyroidism can increase the levels of cholesterol, low-density lipoproteins and triglyceride due to the delivery of hepatic fatty acids, but decrease the level of high-density lipoprotein (HDL), and thus can affect lipid metabolism¹³

Conclusion

Hypothyroidism is an independent risk factor for NAFLD. So NAFLD screening is mandatory for all the patients with Hypothyroidism. Early treatment of Hypothyroidism with thyroxine may reduce the risk of NAFLD and its potential complications. An extensive study is needed to find the effects of thyroid hormone replacement therapy in patients with Hypothyroidism for preventing NAFLD.

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