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Original Research Article

A Study on Thyroid Hormone Abnormalities in Liver Diseases

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Abstract

Introduction: Thyroid hormone abnormalities frequently coexist with liver diseases, impacting disease progression and treatment outcomes. This study aims to explore the spectrum of thyroid dysfunction in liver diseases, elucidating underlying mechanisms to guide targeted interventions and improve patient care.

Methods: The study enrolled eligible inpatients with liver disease, conducting detailed history-taking, clinical examinations, and investigations including thyroid function tests. Symptom duration categorized liver disease as acute or chronic, with ascites and hepatic encephalopathy graded for severity. Institutional ethical approval and informed consent were obtained. Child-Pugh scores assessed chronic liver disease severity.

Results: Ninety-six participants were included, 12 with acute liver disease (ALD). Mean ages were 44.83 ± 15.33 for ALD and 46.13 ± 13.99 for chronic liver disease (CLD). Gender distribution: ALD (91.7% male), CLD (20.2% female). Significant associations were found between ALD and CLD in ascites severity and thyroid hormone levels.

Conclusion: The study elucidates the diverse presentations and underlying mechanisms of liver diseases, highlighting age and gender disparities, as well as the intricate interplay between liver and thyroid function. These findings underscore the importance of personalized management strategies tailored to individual patient characteristics, optimizing clinical outcomes in liver pathology.

Keywords: Liver Disease, Thyroid Dysfunction, Clinical Examination, Investigation, Child-Pugh Score.

Introduction

Thyroid hormone abnormalities frequently accompany liver diseases, constituting a complex interplay between hepatic function and thyroid physiology. [1] Dysregulation in thyroid hormone levels can significantly impact the progression and prognosis of liver diseases, posing diagnostic and therapeutic challenges to clinicians. Understanding the underlying mechanisms of thyroid dysfunction in liver disorders is crucial for developing targeted interventions and improving patient outcomes. [2]

The intricate relationship between thyroid hormone abnormalities and liver diseases underscores the multifaceted nature of their interaction. Hepatic function plays a pivotal role in thyroid hormone metabolism, including synthesis, conversion, and clearance. Conversely, thyroid hormones exert profound effects on hepatic physiology, influencing processes such as lipid metabolism, glucose homeostasis, and detoxification. [2, 4] Dysregulation in thyroid hormone levels, commonly observed in liver diseases, can manifest as both hypothyroidism and hyperthyroidism, further complicating the clinical picture.

The clinical implications of thyroid dysfunction in liver diseases are profound. Altered thyroid hormone levels have been linked to the progression of liver diseases, including non-alcoholic fatty liver disease (NAFLD), liver cirrhosis, and hepatocellular carcinoma (HCC). Moreover, thyroid dysfunction can impact therapeutic interventions, affecting drug metabolism and response to treatment. [1, 5] These complexities pose significant diagnostic and therapeutic challenges to clinicians managing patients with liver diseases. Aim of the study was to comprehensively investigate the spectrum of thyroid hormone abnormalities in various liver diseases.

Methods

It was a cross-sectional study, conducted in the department of General Medicine, GSL Medical College, Rajahmundry. Study was conducted between January 2021 to June 2022. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members.

The inclusion criteria for the study encompassed individuals aged over 18 years, comprising both male and female, who presented with liver disease. The exclusion criteria for the study involved the exclusion of patients with sepsis, cardiac failure, renal failure, nephrotic syndrome, pregnancy, or previous thyroid disorders. Additionally, individuals who were taking medications known to influence thyroid function were also excluded from participation.

This study enrolled all eligible inpatients who met the inclusion criteria based on their presentation with liver disease. Each study subject underwent a detailed history-taking and thorough clinical examination following a pre-structured questionnaire. A comprehensive general physical and systemic examination was conducted, with data collected on symptom duration and the presence of specific clinical features such as jaundice, abdominal distension, edema, upper gastrointestinal bleeding, and hepatic encephalopathy. Acute liver disease was defined when symptom duration was less than one month, while chronic liver disease was characterized by a duration exceeding one month. Ascites and hepatic encephalopathy were graded into different categories based on severity. Institutional ethical review committee approval was obtained prior to the commencement of the study, and written informed consent was obtained from all study participants. A series of investigations were performed on all study subjects, including complete blood count, fasting and postprandial blood sugar levels, liver function tests, coagulation profile, renal function tests, urine examination, electrocardiography, abdominal ultrasonography, and thyroid function tests. Additionally, the Child-Pugh score was calculated for patients with chronic liver disease to assess the severity of their condition. [6]

Statistical analysis: All statistical analyses were conducted using SPSS software trial version 20.0 and MS Excel-2010. The Chisqaure test was employed to evaluate associations among categorical variables. A P value of <0.05 was deemed statistically significant, indicating meaningful associations between variables.

Results

Total 96 members were included, 12 were acute liver disease (ALD) patients. The mean ages were 44.83 ± 15.33 and 46.13 ± 13.99, respectively for ALD and chronic liver disease (CLD) patients; there was no significant difference. Gender wise, In ALD, 91.7% (11) were males and in CLD, 20.2% female were 20.2% (17). In ALD cases, 66.7% had grade 0 ascites, 16.7% grade 1 and 16.7% grade 2 and in CLD cases, 33.3% had grade 0, 53.6% grade 1, and 13.1% grade 2 ascites. The mean FT3 levels were 1.90±0.66pg/ml in ALD and 1.87±0.66pg/ml in CLD. Mean FT4 levels were 1.18±0.23ng/dl in ALD and 1.15±0.36ng/dl in CLD. In ALD cases, a significant association was found between free T3 and FT4 levels, while no significant association was observed in the thyroid profile. In CLD, total T4 showed a significant association with thyroid function test (TFT) derangements. In the study, among CLD cases, 8.3% were classified as Child-Pugh grade A, 21.4% as grade B, and 70.2% as grade C. Significant associations were noted between Child-Pugh score and thyroid derangements, with thyroid hormone levels significantly decreasing as CLD severity increased.

Discussion

In a cohort of 96 participants, comprising 12 with ALD, and the remainder with CLD, mean ages for ALD and CLD were 44.83 ± 15.33 and 46.13 ± 13.99, respectively, showing no significant difference. This finding aligns with recent studies emphasizing the heterogeneous nature of liver disease presentations across different age groups. [7] Although age is a known factor in liver disease progression, its impact on disease severity and prognosis warrants further investigation, particularly concerning variations in etiology and comorbidities. [8] Understanding age-related differences in liver disease can inform tailored management strategies, optimizing patient outcomes.

Gender distribution in liver disease presents intriguing disparities, with 91.7% of ALD cases being male, contrasting with CLD where 20.2% were female. This gender discrepancy underscores emerging research highlighting gender-specific susceptibilities and responses to liver pathology. [9] Recent studies emphasize the intricate interplay between sex hormones, immune responses, and liver function, potentially influencing disease progression and outcomes.[10] Understanding gender disparities in liver disease prevalence and severity is crucial for tailored interventions and improved patient care, shedding light on underlying biological mechanisms and societal factors shaping disease dynamics.

The observed differences in mean FT3 and FT4 levels between ALD and CLD highlight potential variations in thyroid hormone metabolism within different stages of liver pathology. The significant association found between FT3 and FT4 levels in ALD cases underscores the complex interplay be-

tween liver function and thyroid physiology, potentially influenced by factors such as inflammation and hepatic stress. [11] However, the lack of significant association in the thyroid profile suggests nuanced mechanisms governing thyroid hormone regulation in ALD, warranting further investigation into underlying pathways and clinical implications. [12] Recent studies emphasize the bidirectional relationship between liver and thyroid function, with implications for disease progression and management strategies. [13] Understanding the intricate interactions between liver disease and thyroid dysfunction can guide targeted interventions and personalized approaches, optimizing patient outcomes and enhancing our knowledge of endocrine-liver crosstalk. The significant association observed between total T4 levels and TFT derangements in CLD underscores the potential impact of hepatic dysfunction on thyroid hormone metabolism. This finding suggests that as CLD progresses in severity, alterations in total T4 levels may reflect disturbances in thyroid function, possibly mediated by hepatic impairment-induced hormonal dysregulation. [14] Furthermore, the distribution of CLD cases across Child-Pugh grades highlights the clinical relevance of disease severity in modulating thyroid function, with higher proportions of severe CLD cases correlating with greater thyroid hormone abnormalities. Recent research emphasizes the intricate relationship between liver function and thyroid homeostasis, with implications for prognostication and therapeutic interventions in CLD patients. [15, 16] Understanding the impact of CLD severity on thyroid function can inform risk stratification and management strategies tailored to individual patient needs, optimizing clinical outcomes and enhancing our understanding of the complex interplay between liver and endocrine systems.

The study elucidates the diverse presentations and underlying mechanisms of liver diseases, highlighting age and gender disparities, as well as the intricate interplay between liver and thyroid function. These findings underscore the importance of personalized management strategies tailored to individual patient characteristics, optimizing clinical outcomes in liver pathology.

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