

## Serum Thyroid Hormone Levels in Sudanese Patients with Liver Cirrhosis

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### Abstract

**Background:** There are clinical and laboratory associations between thyroid and liver diseases. Patients with chronic liver disease such as cirrhosis may have thyroiditis, hyperthyroidism, or hypothyroidism, because thyroid hormones (THs), particularly triiodothyronine (T3), are potent regulators of multiple physiological activities. The goal of the study is to assess the relationship and interconnection between thyroid hormones, and liver cirrhosis patients.

**Objectives:** A case control study was conducted at Ibn Sena Specialist hospital in Khartoum state, Sudan, during the period of February - June 2016. Participants (N/80) were divided into two groups; patient group (N/40) between the ages of 20-80 years old diagnosed as cirrhosis patients based on their medical record and without any history of without any other chronic condition, controls known as healthy subjects group (N/40).

**Results:** in comparison with the controls, patient with cirrhosis had significantly lower levels of T3 Mean = [1.7685] ± SD (.52121), P=0.01, than controls [2.0220] ± (.31430), while TSH, [1.8993] ± (1.01434) vs. 1.8993±1.01434 for controls, P=0.556, and T4 [105.3340] ± (40.22112) vs. 160.3480±224.51627 for controls=0.131) were in significantly changed.

**Conclusion:** The current study revealed a significant decrease level of T3 and an in significant change in TSH and T4 levels than control groups.

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### I. Introduction

Liver is the largest internal organ of the human body [1]. Functionally it has a major role in the synthesis of carrier proteins and metabolism of various hormones. Thus, liver diseases have been associated with various endocrine disturbances [2]. Cirrhosis is a late stage of liver fibrosis in which the liver function is affected due to long time damage [3]. Cirrhosis considered as the 12th leading cause of death in the United States, and nearly 32,000 deaths each year, men are more affected than women [4].

Endocrine disturbances are common in liver diseases [5], and correlated with the severity of liver dysfunction [6], particularly thyroid hormones, which can cause many disorders, including cardiovascular disease [7, 8], diabetes mellitus [9, 10], and chronic liver disease [11–13] this is due to the important role of liver in the metabolism of thyroid stimulating hormone (TSH), as it is the most important organ in the peripheral conversion of tetraiodothyronine (T4) to triiodothyronine (T3) [14] [15]. Moreover, the liver is included in thyroid hormone conjugation and excretion, also its role in synthesis of thyroid binding globulin [14] [16]. Thyroid hormones (THs), particularly triiodothyronine (T3), are important regulators of multiple physiological activities [17, 18], and regulate the basal metabolic rate (BMR) of all cells, including hepatocytes, thereby modulate hepatic function [19], indeed TH is also required to regulate the oxygen consumption in almost all tissues [20], so that thyroid disorders is one of the most frequent and clinically important endocrine extrahepatic diseases [21]. There are clinical and laboratory associations between thyroid and liver diseases. Patients with hypothyroidism, subacute thyroiditis or hyperthyroidism may have abnormalities in liver function tests [19]. Also in case of stable cirrhosis, a hypothyroidism has been shown which correlates with slow progression of stage of cirrhosis [22, 23]. Therefore thyroid dysfunction may disturb liver functions and liver diseases modulate thyroid hormones metabolism [24]. According to previous studies worldwide cirrhosis more common than previously, and with a mortality rate of 9.7 per 100,000 persons in 2007 in the United States [25]. In Sudan little know about the association between thyroid hormones and liver cirrhosis thus, the current study was conducted to investigate the thyroid hormones (TSH, T3, and T4) levels so as to add to the researches on thyroid dysfunction and cirrhosis in Sudan.

## II. Materials and method

### *Patients*

A case control study was conducted at Ibn Sena Specialist hospital in Khartoum state, Sudan, during the period of February - June 2016. Participants (N/80) were divided into two groups; patient group (N/40) known as cases were males and females between the ages of 20-80 years old. Diagnosis of the patients as cirrhosis based on their medical record and without any history of other chronic condition. Controls known as healthy subjects group (N/40).

Patients with history of organ failure, radiotherapy or chemotherapy and individuals with active infection such as bone and muscle disease, cardiac, pancreatic, diabetes and patients who had not met up the inclusion criteria was excluded from this study.

After signing an informed consent, the demographic and medical history was taken from each group (case and control) using questionnaire filled by medical staff.

Then 5 ml of venous blood was taken from each case and control in plain containers under septic condition, the sample allowed to clot, centrifuged, and serum samples stored at -20C till the assay of TSH, T3, and T4 levels, by using Electrochemiluminescence by Roche Diagnostics Limited, UK.

### *Statistical Analysis*

Data were entered into a computer using SPSS for windows (version 16.0). The significant differences between two groups were used student (t) test. Data was presented as mean ± S.D. The results were expressed in the form of tables and figures, scatter. P value of <0.05 was considered significant.

### *Ethics*

Ethical clearance was obtained from the research board at the Faculty of medical laboratory science, Alzaiem Alazhari University.

## III. Results

In order to evaluate thyroid hormones and its relationship with liver cirrhosis forty patients with liver cirrhosis and another forty healthy individual as control group were included in this study, thyroid function test and liver function test were measured in both groups. As in table (1) the cases and controls were in the age range of 14-70 years and mean age of case groups were 45.6±11.3 years and that of the control group were 43.7±13.5 years. As in table (2) and figure (1) the mean level of serum TSH is 2.01±0.63 and was not found any significant compared control subject. The mean level of T3 was 1.7±0.52 and was found significantly lower than that control one. And the mean level of T4 was 105.3±40.2 that indicated insignificant change compared to control subjects. As in table (3) and scatter (1) (2) (3) there was no significant correlation between duration of cirrhosis and thyroid hormones among cirrhotic patients.

**Table (1)** shows comparison between age of cirrhotic and non-cirrhotic group.

	Case	Control
Age (years)	45.65±11.365 (18-64)	43.73±13.593 (14-70)

**Table (2)** shows statistics and mean differences of TSH, T3 and T4 among case and control groups.

Thyroid hormone	Case	Control	P value
TSH (μIU/ml)	2.0110±0.63390 (.50-3.21)	1.8993±1.01434 (.38-4.07)	0.556
T3 (nmol/l)	1.7685±.52121 (1.01-3.64)	2.0220±.31430 (1.32-2.66)	<b>0.01</b>
T4 (nmol/l)	105.3340±40.22112 (56.33-320.00)	160.3480±224.51627 (79.80-1541.00)	0.131

- P value less than 0.05 considered significant
- Mean± Std. Deviation
- (Minimum- Maximum)

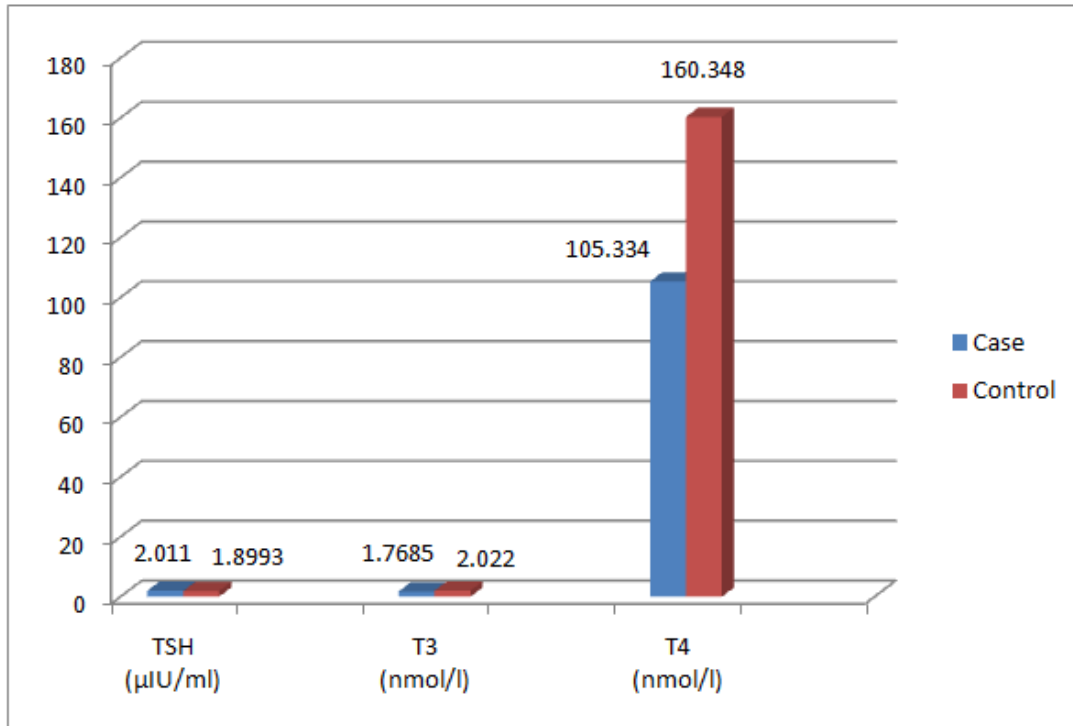
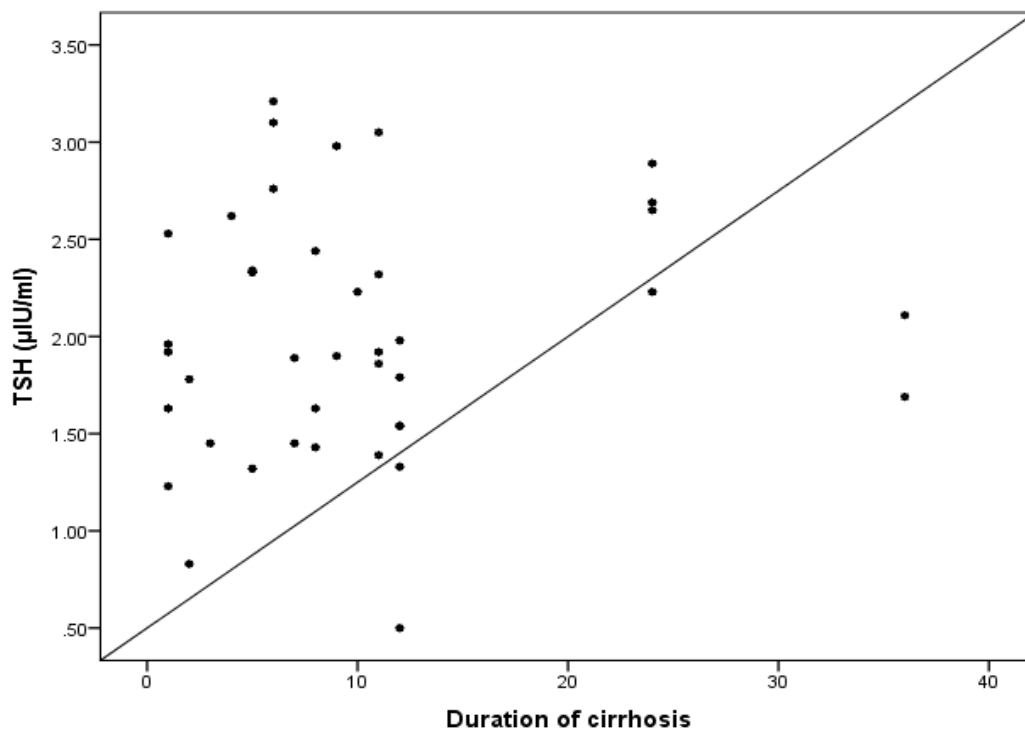


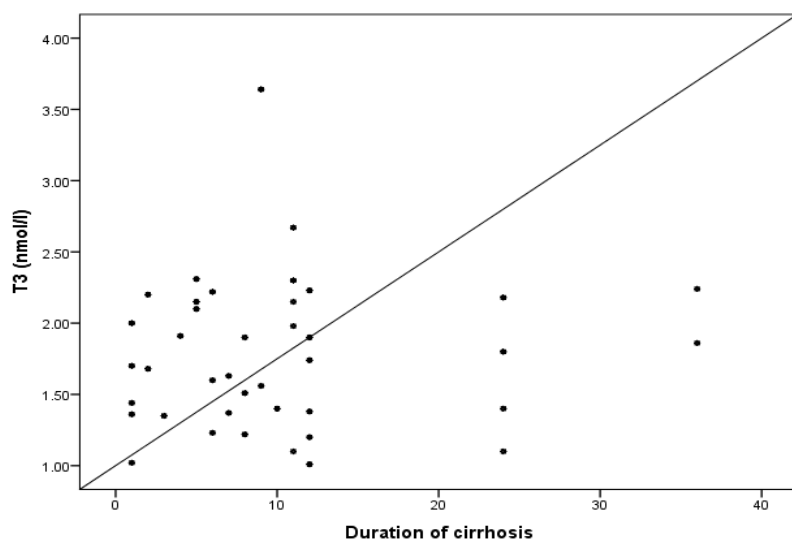
Figure (1) shows means of TSH, T3 and T4 among case and control groups.

Table (3) shows correlations of duration of cirrhosis with TSH, T3 and T4.

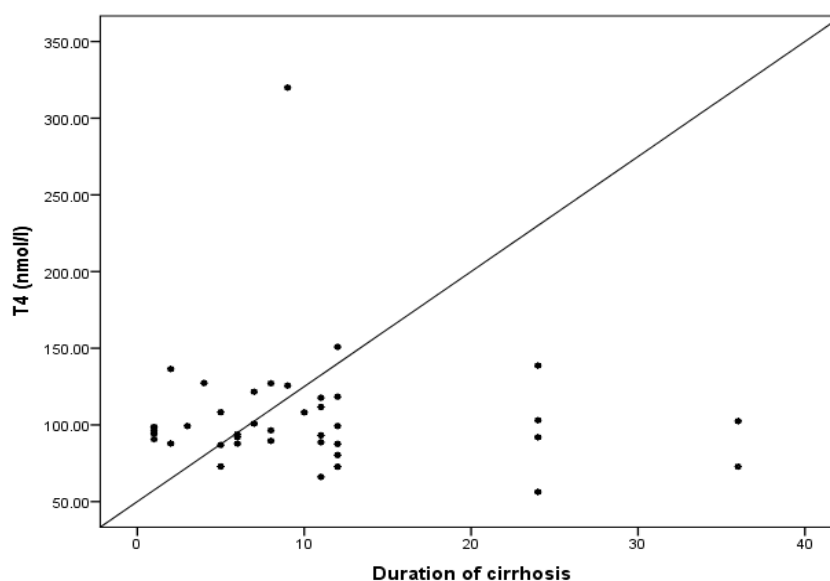
Duration of cirrhosis		TSH (μIU/ml)	T3 (nmol/l)	T4 (nmol/l)
	R value	.143	.072	-.079
	P value	.378	.660	.627



Scatter (1) shows correlation of duration of cirrhosis and TSH.



Scatter (2) shows correlation of duration of cirrhosis and T3



Scatter (3) shows correlation of duration of cirrhosis and T4

#### IV. Discussion

The liver plays an important role in the metabolism of thyroid hormones, as it is the most important organ in the conversion of T4 to T3 by type 1 deiodinase [14, 15]. The main findings of the current study were; while the levels of T3 were significantly low, T4, and TSH were showed insignificant changes as shown table (2),so that this study confirms the existence of abnormalities in thyroid function tests in liver cirrhosis. The low total T3 with generally normal total T4 and TSH concentrations in the absence of clinical hypothyroidism has been frequently reported in patients with chronic liver disease as well as in many other non-thyroidal illnesses [26,27, 28].This study revealed that decrease total T3 probably reflects a decrease in deiodinase1 activity in the liver of cirrhotic and that was goes with other previous studies[29, 30, 31].There was no significant correlation between duration of cirrhosis and thyroid hormones among cirrhotic patients table (3),scatter (1, 2, and 3). These findings were not to found agree to that study reported by Faridaetal. (27), the reason for this discrepancy is unclear, this may reflect the heterogeneity of the patient population studied (in terms of type and severity of the disease).

#### V. Conclusion

The current study revealed significant decrease level of T3 (p value <0.05) in cirrhotic patients than controls, while TSH and T4 were in significantly changed. It also appears that there was no significant correlation between duration of cirrhosis and thyroid hormones among cirrhotic patients.

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### Competing interests

The authors declare that they have no competing interests.

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