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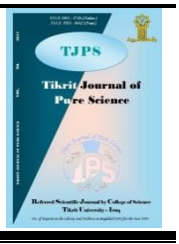

Thyroid Function in patients with Ischemic Heart Diseases

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Abstract

The effects of thyroid hormones on the cardiovascular system are the most clinically useful and sensitive signs of thyroid dysfunction. Regarding pathophysiology, thyroid dysfunction has essential cardiovascular consequences in myocardial contractility, peripheral hemodynamics, and heart rate. The aim: To study the association of serum TSH, T4, and T3 levels on ischemic heart diseases. Patients & methods a cross sectional study was conducted in Sallah Alddin general hospital in Tikrit city – Iraq , from 1st January to 30th of June 2017. Fifty patients (34 male & 16 female) have joined this study age (mean 58.6 ± 15.2 years), all suffering from ischemic heart diseases (myocardial infarction, angina, & congestive heart failure) & admitted to the Coronary cure unite in the hospital. Also, 50 control healthy subjects were participated in the present study, (30 males and 20 female subjects). Results anthropometric measurements for both males and females (age, weight, height BMI) show no significant differences between patients and the control, while, the BMI for female group exhibits a significant difference. Female and male lipid profile results indicate good significant differences between patients and control except for LDL result for female. Moreover, there are no significant differences for LDL and VLDL in male patients. The TSH, T3, T4, and troponin levels in both male and female patients show significant differences between them and the control groups except T3 level show no significant differences.

Introduction

There are complex and intimate functional relation of thyroid gland and some heart diseases due to sharing the common embryologic origin[1]. The clinical signs for cardiovascular abnormality are the most character of thyroid gland dysfunction. In particular, hyperthyroidism and/or hypothyroidism symptom, observed on heart patients, may due to the variation of thyroid gland secretion [2]. However, there is a mutual relation between acute and chronic cardiovascular disease with alteration of thyroid hormones metabolism leading to hemodynamic and heart impairment[2].The hyperthyroidism in the physiological activity play a vital role in hemodynamic changes and cardiovascular complications[3]. In fact, the decrease in T3 (low T3 syndrome) in patients' blood has a negative effect on the cardiac and vessels performance[3].

Thyroid hormone action entirely imply all body organ ,specially the heart which reflect to the minimal changes in thyroid hormone serum levels as monitored in patients with subclinical hyperthyroidism. This action are diagnose by normal Triiodothyronin (T3), thyroxin (T4) levels, and suppressed thyroid stimulating hormone (TSH) which cause sensible changes in cardiac parameters like heart rate increase, myocardial contractility, change in the mass of the left ventricular muscle, and atrial arrhythmias [3].

However, variation of thyroid metabolism is clear in the first stage of left ventricular dysfunction. While, the decrease in T3 hormone is signs to the seriousness of heart disease and symptoms, as mentioned elsewhere[4].

Chest pain may considered as a first sign to admit patient to the primary care unit, but it is not always a sign of heart attack it may be due to less sever condition.

In such case, specific marker like troponin should be measured to indicate the severity of the disease even at low levels. That may attributed to a large percent of troponin found in cardiac muscle and less amounts in skeletal muscle, while there are no troponins in smooth muscle. Moreover, cardiac troponin, also, sign for diagnosis of different heart diseases such as myocardial necrosis and stratification [5].On the other hand, creatine kinase and lactate dehydrogenase are considered a nonspecific markers for acute coronary syndrome [6].

aim: To study the association of serum thyroid stimulating hormone, triiodothyronin, and thyroxin levels on ischemic heart diseases.

Statistical analysis

All data were presented as a mean and standard deviation (SD). Unpaired student T test was used to compare between variables- P value less than 0.05 was used as a significant value. Smith's statistical package (ssp) version 2.75 was used for data analysis.

Subjects and methods

A cross sectional study was conducted in Sallah Alddin general hospital in Tikrit city – Iraq , from the beginning of January to the end of June 2017.

Fifty patients (34 males & 16 females) enrolled in this study age (mean 58.6 ± 15.2 years), all suffering from ischemic heart diseases (myocardial infarction, angina, & congestive heart failure) & admitted to the CCU in the hospital. Also, 50 control healthy subjects were participated in the present study, (30 males and 20 female subjects).

All patients filled a questioners ask about history of disease & medications used. Heart rate, blood pressure & ECG were taken for all patients.

Five ml blood sample was taken from all the patients; blood sample was stored in plane tube for serum separation. Serum collected & stored at (- 18^0 C) for further hormonal (TSH, T3, T4), and lipid profile analysis & serum Troponin.

Thyroid hormones analyzed by ELIZA technique ,the kit used was from (Monobind, USA).

Troponin analyzed by ELIZA technique, the kit used was from (Monobind , USA).

Lipid profile analyzed by using special kits from (Bio- Labo, France).

Results

The Female Results

Table (1) list the anthropometric measurements for female patients and the control group. The results indicate no significant differences values between patients and the control group except BMI show a significant difference .

Table (1) show the mean and standard deviation (SD) of age, weight, and height of the female patients and control.

Parameters	Patients	Control	P value
Age (years)	64.87 ± 19.8	62.4 ± 12.4	NS
Body weight(Kg)	67.87 ± 12.2	61.6 ± 10.3	NS
Height(Cm)	160.1 ± 5.7	167.8 ± 9.6	NS
BMI (Kg/m^2)	26.5 ± 3.7	22.8 ± 11.1	0.01

The lipid profile concentrations for the female patients and the control group with the mean and standard deviation are shown in Table (2). The cholesterol level for patients group was (182.92 ± 22.3) mg/dl and for control group was (178.67 ± 36.47) mg/dl, which show a significant difference between the two groups (P value = 0.05).

Table (2) serum Lipid Profile concentrations for female patients and the control subjects.

Parameters	Patients	Controls	P value
Cholesterol (mg/dl)	182.92 ± 22.3	178.67 ± 36.47	0.05*
TG(mg/dl)	189.1 ± 36.2	152.40 ± 40.45	0.05*
VLDLc (mg/dl)	37.92 ± 7.2	30.77 ±7.91	0.01**
LDLc (mg/dl)	93.45 ± 28.4	87.66 ± 25.59	NS
HDLc (mg/dl)	33.42 ± 6.02	59.65 ± 11.78	0.01**

Whereas, the triglyceride level for patients group was (189.1 ± 36.2) mg/dl and for control group was (152.40 ± 40.45) mg/dl. That means a significant difference between the two groups (P value = 0.05). The VLDL level for patients group was (37.92 ± 7.2) mg/dl, while for control group was (30.77 ±7.91) mg/dl and show a significant difference between patients and control groups (P value = 0.01). On the other hand, the LDL level for patients group was (93.45 ± 28.4) mg/dl and for control group was (87.66 ± 25.59) mg/dl. This result show no significant difference between the two groups. The HDL level for patients was (33.42 ± 6.02) mg/ dl and for control group was (59.65 ±11.78), this result show a significant difference between the patients and control groups (P value = 0.01).

In addition, the Thyroid hormones, TSH, and Troponin examination are listed in table (3) which shows the mean and standard deviation of thyroid hormones. The TSH level for patients group was(2.02 ± 1.52) mic.IU/ml, while its level for control group was(1.127 ± 0.734) mic.IU/ml, which show a significant difference P value = 0.01.

Table (3) the mean and SD of Thyroid hormones, TSH, and Troponin in the serum of female patients and control subject.

Parameters	Patients	Controls	P value
TSH (mic.IU/ml)	2.02 ± 1.52	1.127 ± 0.734	0.01**
T3 (ng/ml)	1.549 ± 0.57	1.626 ± 0.325	NS
T4 (micro/dl)	7.3 ± 2.3	10.27 ± 5.26	0.05*
Troponin (ng/ml)	0.266 ± 0.149	0.16 ± 0.1	0.01**

The results in table (3) explain the T3 level for patients group was(1.549 ± 0.57) ng/ml and its level for control group was (1.626 ±0.325) Ng/ml. This result show no significant difference between the two groups. Furthermore, the T4 level for patients group was (7.3 ±2.3) micro/dl ,while its level for control group was (10.27 ±5.26) micro/dl. Hence, such finding show a significant difference between the two groups P value = 0.05, Troponin level of female patients was (0.266 ± 0.149) ng/ml and for control group was (0.16± 0.1) ng/ml, which show a significant difference between the two groups P value = 0.01.

The Male Results

Table (4) shows the mean and standard deviation of anthropometric measurements for male patient and male control group. It is observed from the results that all parameters; age, weight, the height, and BMI have no significant differences between patients and the control group.

Table (4) age, body weight and height of male patients and control

Parameters	Controls	Patients	P value
Age (years)	57.3 ± 9.3	55.76 ± 11.7	NS
Body weight (Kg)	78.3 ± 11.2	75.29 ± 10.53	NS
Height (Cm)	170.3 ± 5.6	168.41 ± 4.9	NS
BMI(Kg /m^2)	27 ± 3.1	26 ± 4.7	NS

However, table (5) show the concentrations of lipid profile results for male patients and control group. The cholesterol level for patients was (6.67 ± 0.36) mmol/l and for control group was (5.1 ± 0.21) mmol/l that show significant difference P value = 0.05.

Table (5) levels of lipid profile of male patients and control

Parameters	Patients	Controls	P value
Cholesterol mmol/l	6.67 ± 0.36	5.1 ± 0.21	0.05*
TG (mmol/l)	2.95 ± 0.37	2.12 ± 0.32	0.05*
VLDLc (mmol/l)	1.31 ± 0.19	1.14 ± 0.18	NS
LDLc (mmol/l)	4.92 ± 0.59	4.18 ± 1.2	NS
HDLc (mmol/l)	0.51 ± 0.07	0.75 ± 0.14	0.05*

Triglyceride level for patients group was (2.95± 0.37) mmol/l and for control was (2.12 ± 0.32) mmol/l, this result show, also, significant difference between the two groups P value = 0.05. VLDL level for patients was (1.31 ± 0.19) and for control was (1.14± 0.18) mmol/l exhibits no significant difference between them. Also, LDL level, for patients was (4.92 ± 0.59) mmol/l and for control was (4.18 ± 1.2) mmol/l, show no significant difference between them. While, HDL level for patients group was (0.51 ± 0.07) mmol/l, and for control was (0.75 ± 0.14) mmol/l have shown significant difference between them the P value was = 0.05.

On the other hand, table (6) shows the serum levels for T3, T4, TSH, and Troponin of men patients and control group. The TSH level for patients was (2.138 ± 1.9) and for control group was (1.38 ± 0.9) (µ.IU/ml) which show significant difference P value = 0.05.

Table (6) Thyroid hormone, TSH, and Troponin in the serum of men patients and control

Parameters	Patients	Controls	P value
TSH(µ.IU/ml)	2.138 ± 1.9	1.38 ± 0.9	0.05*
T3(Ng/ml)	1.54 ± 0.51	1.94 ± 0.31	NS
T4(µg/dl)	10.64 ± 2.59	13.43 ± 1.23	0.05*
Troponin(ng/ml)	0.417 ± 0.16	0.203 ± 0.12	0.01**

Table (6) also list the value of T3 level for patients (1.54 ± 0.51) and for control (1.94 ± 0.31) (Ng/ml). The result show no significant difference. While the T4 level for patients was (10.64± 2.59) and for control (13.43± 1.23) (µ/dl), which show a significant difference between the two groups P value = 0.05. The Troponin level for patients was (0.417 ± 0.16) and for the control (0.203 ± 0.12) (ng/ml) also show a significant difference between the two groups P value =0.01.

Discussion

The predictors such as body mass index (BMI, weight in kilograms divided by the square of the height in meters), waist to hip ratio (WHR), waist circumference (WC), and waist to height ratio (WHtR) are widely used in clinical studies. Many studies have suggested that these indices are related to the obesity and health status which strongly associated with various diseases, nevertheless, these indices do not always provide useful information[7].

In this study there is no significant differences in anthropometric measurements and BMI, in relation to ischemic heart disease for male patients, and this was in good agreement with some studies[7].

Most of the mentioned studies are consistent in demonstrating a strong positive association between BMI and the risk of IHD, at least among individuals with BMI 20 kg/m2 at the start of the follow-up. Even within this range, however, questions remain about the magnitude of the risk associated with BMI in various different circumstances (e.g. at different ages, in different populations, and at different levels of other risk factors). Moreover, below this range, there is substantial uncertainty about not only the strength but also the direction of the relationship[8].

On the other hand, there has been inconsistent evidence from the previously published studies in Western populations as to whether there is a threshold of BMI, below which lower levels of BMI, are no longer associated with lower risks of IHD. Some studies have reported evidence of such a threshold, with the reported thresholds ranging from as high as 27 kg/m^2 to as low as 20 kg/m**2**, whereas others have reported no such threshold. The fundamental problem with most previous studies has been the relatively small number of IHD cases at low BMI values (owing to the small number of participants with low BMI in Western populations)[8]. However, our findings were in good agreement with these previous studies.

Recently, there are well known risk factors for heart diseases like history of the family, hypertension, diabetes, smoking, and high level of LDL cholesterol. while now a days , the most dangerous risk is the LDL cholesterol level and should be measured routinely due to its importance in atherosclerosis and coronary diseases[9].

In this study the significant increase in lipid profile was noted in patients ischemic heart disease (IHD). These findings are in good agreement with the findings of other studies [10].Serum cholesterol, serum triglycerides, serum VLDLc, serum LDLc are statistically higher in IHD patients as compared to controls, whereas serum HDLc was found to be low.

The mean VLDLc as well as mean LDLc levels were significantly increased in IHD cases as compared to controls. The LDLc level above 130mg% is considered to be a risk factor for development of IHD[11].

The highly affected body organ by thyroid hormones dysfunction is the cardiovascular system. In connection with pathophysiology, the changes in thyroid secretion will lead to heart muscle contractility, heart rate, and peripheral circulation hemodynamics changes[12].

Hypothyroidism even in the form of a subclinical condition, especially when TSH level reach more than 10 µIU/l , the patient will suffer coronary heart disease signs and may lead to death[13].

Thyroid gland has a wide range of activities in all body tissues, but the cardiovascular system and kidney are the most important body systems that the thyroid gland act on.

High percent of abnormalities in thyroid gland morphology and dysfunction may associated with diabetes, while low T3 syndrome is associated with chronic kidney disease [14].

Increased cardiac preload, cardiac output, and arterial stiffness may lead to increase systolic blood pressure due to hyperthyroid secretions. Consequently, the left ventricular hypertrophy would accompanying with the hyperthyroid state. Furthermore, in the long term, it will lead to diastolic dysfunction because of over secretion of thyroid gland, and in severe, untreated cases, it may even lead to heart failure[15].

Increase rates of pulmonary hypertension have been observed in hyperthyroidism. Sinus tachycardia is the most common rhythm alteration in patients with hyperthyroidism. However, atrial fibrillation is the most clinically important arrhythmia of hyperthyroidism [16].

A small percentage of hyperthyroid patients can present with angina-like chest pain that could imply myocardial ischemia due to increase in cardiac work or even a form of vasospastic angina. Even in its sub-clinical form, hyperthyroidism is associated with an increased risk of coronary heart disease events and mortality, especially when levels of TSH are below 0.10 mIU/L [17].

The finding of this investigation show thyroid dysfunction that may associated with different cardiovascular symptoms and this is in good agreement with many studies [12- 17].

In case of myocardial infarction, the different types of cardiac troponins (cTnI, cTnT) are increase within 6 hrs, and may be measured in the blood during later 12hrs, while the troponins level return to normal level in not less than 10 days.

In different types of myocardial infarction , congestive heart failure, unstable angina, chronic kidney disease, any increase in cardiac troponins level may suggest a more difficult state and increase the cardiac mortality rate, or coronary thrombi, and ventricular dysfunction [18].

Results of different ischemic heart disease patients in this study show elevated troponin level which are in good agreement with the previous study[18].

Conclusion

Cardiovascular abnormalities that appear due to thyroid dysfunction reflect the strong relation between thyroid gland and the heart.

The signs and symptoms of cardiovascular system diseases may be emerged from thyroid dysfunction and increasing cardiovascular risk. Therefore, a routine thyroid hormones measurement should be done for the newly diagnosed cardiovascular disease patients , especially over 40 years old.

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تاثير وظائف الغدة الدرقية على امراض القلب الاقفارية

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فرع الفسلجة الطبية ، كلية الطب ، جامعة تكريت ، تكريت ، العراق

الملخص

يركز البحث على دراسة تأثير هورمونات الغدة الدرقية على جهاز القلب والاوعية الدموية في المرضى المصابين بأمراض القلب الاقفارية,

الهدف: دراسة العلاقة بين مستوى هورمونات الغدة الدرقية في الدم وامراض القلب الاقفارية.

العينات وطريقة العمل: تمت الدراسة في مستشفى صلاح الدين العام للفترة من الاول من كانون الثاني الى الثلاثين من حزيران سنة 2017م. شملت الدراسة خمسون مريضا (34 ذكر و 16 انثى) جميعهم يعانون من امراض القلب الاقفارية, اما المجموعة القياسية شملت خمسون شخصا من الاصحاء (30 ذكر و20 انثى),

النتائج: معامل كتلة الجسم اظهر فرقا معنوياً في مجموعة النساء فقط, اما نتائج مستويات الدهون بالدم جميعها اظهرت فروقا معنوية بين المرضى والاصحاء ما عدا كولسترول واطئ الكثافة لم يظهرفرقا معنويافي مجموعة النساء ,وكولسترول واطئ الكثافة و كولسترول واطئ الكثافة جدا لم يظهرا فروقا معنويه في مجموعة الرجال. اما بالنسبة لبروتين التروبونين وهورمونات الغدة الدرقية فجميعهم اظهروا فروقا معنوية بين المرضى والاصحاء ما عدا هورمون ترايايودوثايرونين لم يظهر فرقا معنوياً.