

Alteration of Thyroid Function, Lipid Profile Measurements in Some Iraqi Patients with Corona Virus (SARS-COV-2)

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Abstract

A new coronavirus which known as severe acute respiratory syndrome coronavirus-2 (SARS-COV-2) is main causative agent for the corona virus 19 (COVID-19) global widespread illness may affect multiple organ system in human body, one of the most common causes of thyroid problem and lipid profile alteration may be resulting from the complications of COVID 19 illness. A total of (50) Iraqi patients and healthy females were participated with the study to find out the effects of Covid 19 illness on thyroid hormones (TSH, TT#, and TT4) and lipid profile measurements (HDL-Cholesterol, LDL-cholesterol, Total cholesterol and triglyceride).

The findings of current study demonstrated that the corona virus affect the the thyroid functions and lead to alteration in the main measurements of lipid profile.

Key words: COVID 19, thyroid function, lipid profile

Introduction

The corona virus illness 2019 (COVID-19) pandemic keeps on influencing the worldwide to affect the global society, and we need to know more about its pathophysiology, so too interest in the endocrine system impact of the agent of Covid 19. Corona viruses are well known to be aggressive effects on many endocrine glands, including the thyroid. If patients infected with Covid, a related corona virus to SARS virus, will damage to the follicular and para-follicular tissues and cells of the thyroid gland was investigated after human death [1]. Moreover, corona viruses have been diagnosed in the pituitary gland after death of human [2], and reduce staining thyroid stimulating hormone (TSH) has been detected in the frontal pituitary gland of patients diagnosed with Covid disease [3]. On the other hand, corona virus can enter cells using the angiotensin-converting enzyme 2 (ACE2) receptor, that is greatly expressed in the thyroid organ [4]. Therefore, the hypothalamic-pituitary-thyroid line may be useable to disturbance in Covid positive patients. Actually, there are contradictory facts related to the effect of corona virus on thyroid role

in human body. Non acute thyroiditis dispensing with overt toxicity of thyroid which has been reported with SARS-COV-2 [5,6,7].

Lipids are important to cell components of corona virus. In fact, they are contributing in blending of it membrane within the host cell, increasing of viral cells, as well as inside and outside the cells [8]. Lipid and cholesterol play an especially essential role in the first stage of infection of cell [9].

Among medical laboratory measurements, the lipid profile of Covid positive patients has not been completely looking over. A newly, one study investigated that serum cholesterol levels was low in Covid positive patients, compared to those non infected, so, thus conclude that cholesterol may play a special role not only in viral multiplication, but also in a promoting of immune system [10].

Materials and Subjects

Patients

The total of 25 patients with positive result of

COVID-19 who's admitted to the Al-Kindy teaching hospital in Baghdad city, between September 2020 and November 2020. We excluded the patients of thyroid disease medical history, pregnant women, or patient without thyroid function assessment. All the diagnosed cases with positive results for Covid 19, in (PCR) polymerase chain reaction of specimens of the respiratory tract. The samples were divided into two clinical categories: severe cases (n=12) and moderate cases (n=13) depended on clinical signs and symptoms, laboratory tests, and CT scan for patients chest in accordance to the diagnosis regime and treatment policy plan for corona virus disease which are documented by Ministry of Health and Environment in Iraq.

The clinical classifications were severe cases, adults female who have the following criteria: respiratory rate ≥ 30 , breaths rate per minute, O_2 saturation less than 93% at rest condition, and partial pressure of oxygen (PaO_2) / concentration of O_2 (FiO_2) equal or less than 300 mmHg. Patients have more than 50 % pulmonary lesions within first and second day of infection were classified also as severe cases; moderate cases; including the patients who have clinical symptoms like fever and respiratory tract disorders, and pneumonia infection can be observed through the chest X-ray.

Methods and data Collection

The 25 patients who had blood sample for thyroid function tested, including (Serum TT4) total thyroxin, (serum TT3) total triiodothyronine, and thyroxin stimulating hormone (TSH) within 72 hours after admission to hospital, in addition to conduct the lipid profile testing (total serum cholesterol, serum triglyceride, high-density lipoprotein (HDL), low-density lipoproteins and very low-density lipoproteins (LDL) and (vLDL) respectively. Serum albumin (Alb) and interleukin-6 (IL-6) were tested. Healthy participants of similar ages (43.3 ± 4.1 years old) and all of patients

and control groups were female who submit to ordinary physical assessment in the same period were included as the (non Covid group) or control group. All members of the control group had no thyroid dysfunction and no other medical and clinical history that might affect the functions of thyroid gland.

The immunological luminescent assay (Abbott i2000, Wiesbaden, Germany) that used for thyroid hormone testing.

Statistical Analysis

A package for the social science system version SPSS 20 was used for data analyzing. ANOVA-test has been done to calculate previous studies. P value equal or less than 0.05 was considered as the level of statistically significance.

Results

In this study, the subjects were divided in two groups, the first group is patient group (n=25), and the second group is control group (n=25).

The first group (patients group) were also divided in two diagnostic categories according to the severity of COVID 19 infection, the 1st one, patient with moderate infection of Covid19 (n=13), and the 2nd one, patients with severe infection of Covid 19 (n=12).

The table (1) shows the age of patients was (39.4 ± 3.5) years and (41.6 ± 5.3) years for moderate and severe illness respectively and was (43.3 ± 4.1) years for control group. The BMI for both patient and control group was as follow, (25.7 ± 3.4) and (24.9 ± 2.8) for moderate and severe infections and (24.7 ± 3.23) for control group.

According to the thyroid functions tests, there was a state of decline in the functions of the thyroid gland (TSH, TT3 and TT4) in all patients group when compared with the control group. (P value ≤ 0.001 and P value ≤ 0.01).

Table 1. Comparison of Serum Thyroid Functions tests between COVID-19 and Control Groups.

parameters	COVID-19 group (n= 25) Mean ± SD		* P value	Control (n= 25) Mean ± SD	# P value
	Moderate (n=13)	severe (n=12)			
Age (years)	39.4 ± 3.5	41.6 ± 5.3	NS	43.3 ± 4.1	NS
BMI	25.7 ± 3.4	24.9 ± 2.8	NS	24.7 ± 3.23	NS
TSH (µUI/mL)	0.72 ± 0.07	0.34 ± 0.05	0.001	2.1 ± 0.8	0.001
TT3 (nmol/L)	1.47 ± 0.21	0.83 ± 0.11	0.001	1.7 ± 0.32	0.01
TT4 (nmol/L)	101.4 ± 13.7	81.6 ± 12.3	0.001	113 ± 9.3	0.01

COVID-19, corona virus disease 2019; Control group; TSH, thyrotropin; N.V. (0.27- 4.2 µUI/MI)/ TT3, total triiodothyronine; N.V. (1.2-3.10 nmol/L) TT4, total thyroxine. N.V.(66-181nmol/L).

- # P value: (P value between COVID-19 patients and control).

- *P value: (P value between moderate and severe Covid-19 patients).

The findings in the table (2) indicate that there was a decrease in the level of albumin in the patients’ group (39.3 ± 5.7) and (31.62 ± 2.9) compared with the control group (46.7 ± 4.5, P value ≤ 0.01).

Table 2. Comparison between serum Alb and interleukin-6 in both COVID-19 and Control Groups.

parameters	COVID-19 (n= 25) Mean ± SD		* P value	Control/Non COVID-19 (n= 25) Mean ± SD	# P value
	Moderate (n=13)	Severe (n=12)			
Alb (g/L)	39.3 ± 5.7	31.62 ± 2.9	0.001	46.7 ± 4.5	0.01
IL-6 (pg/mL)	9.46 ± 3.2	13.2 ± 4.7	0.01	6.4 ± 5.1	0.01

Alb, albumin;(34 - 54 g/L) / IL-6, interleukin-6 (0– 16.4 pg/mL)

- # P value: (P value between COVID-19 patients and control).

- *P value: (P value between moderate and severe Covid-19 patients).

The study also showed a remarkable elevation in the level of the immune marker (IL-6) of patients group (9.46 ± 3.2), and (13.2 ± 4.7) respectively for moderate and severe infection when compared with control group (6.4 ± 5.1) with P value ≤ 0.01.

Table 3. Comparison of Serum Cholesterol, Triglyceride, VLDL, HDL, and LDL between COVID-19 and Control Groups.

parameters	COVID-19 (n= 25) Mean ± SD		* P value	Control/Non COVID-19 (n= 25) Mean ± SD	# P value
	Moderate (n=13)	Severe (n=12)			
S. Cholesterol (mg/dL)	189.4 ± 17.6	201.15 ± 9.6	NS	191.6 ± 23.7	NS
S. Triglyceride (mg/dL)	128.9 ± 23.6	133.7 ± 11	NS	121.8 ± 41.9	0.05
S. VLDL (mg/dL)	25.3 ± 4.9	26.6 ± 3.6	NS	24.4 ± 12.9	NS
S. HDL (mg/dL)	48.3 ± 5.4	45.6 ± 3.9	NS	49.3 ± 7.8	0.05
S. LDL (mg/dL)	112.5 ± 25.0	132.3 ± 11.9	0.01	129.6 ± 27.4	0.05

The results of the table (3) clarified that the lipid profile tests was a slight convergence and agreement between the patient group and the control group (S.CHOL, 189.4 ± 17.6 and 201.15 ± 9.6), (S.TRIGLY. 128.9 ± 23.6 and 133.7 ± 11). (S.VLDL. 25.3 ± 4.9 and 26.6 ± 3.6), (S.HDL. 48.3 ± 5.4 and 45.6 ± 3.9) for both moderate and severe infection of COVID 19 respectively, while in control group the results were (191.6 ± 23.7, 121.8 ± 41.9, 24.4 ± 12.9, and 49.3 ± 7.8) for (S.CHOL, S.TRIGLY, S.VLDL and S.HDL). While for LDL level, there is a significant differences at a probability level (P value ≤ 0.05) between patients group and control group.

Discussion

COVID-19 is a serious disease that is caused a global pandemic all over the world. As a novel disease with dangerous and high mortality rates, the pathological and physiological changes of COVID-19 have not wildly studied. Numerous researches have clarified severe and multiple impacts of Covid-19 in many different human body systems including respiratory, immunity, circulation digestive, liver, and even renal systems [11].

Moreover, whether corona virus affects human thyroid gland remains unrevealed. In our clinical

study, we tried to know the real effects of COVID-19 regarding thyroid gland and some other parameters like lipid profile, serum albumin (S. Alb) and interleukin-6 (IL-6) of patients. The findings of the study determine a small depletion in TT3, TT4, and even in TSH within the patients of Covid positive compared to control group (Covid negative cases). The researcher established that there was a decreasing in levels of TT4 and thyroid stimulating hormone of patients who was admission with COVID-19, and others who was patients who was not diagnosed and admitted with corona virus.

Here, the researcher was find out the impact of COVID-19 on thyroid gland and its function. Also found the patients with positive Covid-19 have lower level of TSH and level of TT3 than healthy group.

Like these abnormalities of thyroid functions in Covid positive patients may be more obviously than thyroid disorders, including microbial infection, malignant tumors, cardiovascular diseases, gastrointestinal disorders, and burn trauma [12]. It was well confirmed that these reductions and others malfunction of thyroid organ is usually a consequence of an acute state response to systemic infections or restriction of macro

essential nutrient and usually appear as decreased serum levels of TT3, with low or normal TT4 level and TSH concentration [12,13]. The situation of decreased TT3 and TSH in patient with Covid disease was consistent with non thyroid illness. In COVID-19 patients, a panel of immune marker, such as interleukins (2, 6, 7), interferon gamma, and tumor necrosis factors (TNF), are associated with severity of disease and mortality rate of patients [14, 15, 16, 17]. The findings also observed that thyroid gland disorders were associated with elevation of inflammatory biomarkers such as IL-6, which is played a key role in thyroid gland problems of COVID-19. So, a serious illness of corona virus –SARS- COV-2 is a primary causing agent of thyroidal malfunctions.

The major result of the study is that corona viral disease in both cases (moderate and severe) and its complications may lead to profound effect on lipid metabolic in human body. The main part played by inflammatory processes is determining most abnormalities of lipid profile (which is mean, reduction HDL and LDL levels) is reflected by the correlation with IL-6, as clarified in table (3). Actually, the researcher find out that the baseline lipid levels, especially, HDL and LDL of COVID 19 patients were notably less than in healthy control group ($P < 0.05$), whilst triglyceride, total cholesterol levels founded to be increases. Like these changes results have been confirmed in patients with viral disuses like AIDS or HIV [18].

More accurate, Grunfeld *et al.* obviously determine that HIV patients showed increasing in plasma triglyceride, fatty acid values, while those HDL and cholesterol were indicated to be reduced [20]. More studies confirmed that patient with *human immunodeficiency virus* tend to be developed like others forms of dyslipidemia, (which is mean, low LDL levels, low blood cholesterol level and increasing of triglycerides) [17].

Similarly, Hu *et al.* [9] recently established that levels HDL and LDL in COVID-19 positive patients were lower than in those of non-Covid persons. The findings of these researches are in keeping with results which obtained in this study, in addition to triglycerides, that was found to be elevated more than in the control

group [10].

Conclusions

This study concluded that abnormalities of thyroid gland functions were evident in COVID-19 patients. The thyroid disorders appear to be continuously changed within the track of illness. In addition the researcher thought the lipid profile components, mainly cholesterol, may play a key role in viral growth, and immunity promotion in patients with COVID 19.

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