



ASSESSMENT OF THYROID FUNCTION LEVELS IN COVID-19 IN TERMS OF OUTCOME.

General Medicine

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ABSTRACT

Introduction: The outbreak and rapid spread of the novel SARS-CoV-2, the causative agent of the coronavirus disease 2019 (COVID-19), has evolved into an unprecedented global pandemic. The infection impairs several human organs and systems; however, it is not clear how it affects thyroid function. The study therefore aimed at measuring plasma levels of thyroid hormones and CRP and high resolution CT chest in COVID-19 patients and apparently healthy uninfected controls to assess the possible effect of SAR-CoV-2 infection on thyroid function. **Methods:** in this cross-sectional study carried out after approval from IEC. A total of 100 consenting participants comprising, RT-PCR confirmed COVID-19 patients were recruited for this study. **Results:** In our study mean age of 49.22 ± 16.68 years with mean age between men was 50.42 years and females were 48.02 years. The thyroid profile of these patients was compared to inflammatory markers and high-resolution CT scan. It was observed that about out of 100 patients, majority 52(52%) of patients were having normal thyroid function levels with mean T3 Levels of 0.9 ± 0.22 , T4 levels of 9.53 ± 1.78 and TSH of 1.89 ± 1.22 . with only 17% of patients were having raised CRP levels with mean of 2.24 ± 1.11 . mean LDH of 290. In our study, low T3 levels was the most common abnormality observed. 38 patients (38%) were having low T3 levels. Out of these patients 27 patients having raised CRP levels and remaining 11 patients with normal CRP levels. **Conclusion:** Although there was a preponderance of euthyroidism was observed. In our study, Sick euthyroid was seen in the majority of patients hospitalized with COVID 19. Low T3 levels was associated increased inflammation and lung parenchymal involvement in high resolution CT chest scan and was associated with disease severity. Consequently, it is important to monitor thyroid function both during and after COVID-19 treatment.

KEYWORDS

T3, T4, TSH, COVID-19, hypothyroidism, hyperthyroidism, status unknown, thyroid function level, inflammatory markers, CRP, low T3 syndrome. Sick euthyroid syndrome.

INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-caused new coronavirus disease 2019 (COVID-19) has spread over the entire world and is now the number one public health concern, posing a serious threat to global health. In India, 44,682,784 cases had been confirmed as of Jan 2022, with 530,740 deaths reported, or a case fatality rate of 1.18%. The case mortality rate in India has decreased compared to other WHO regions. As of 23 January 2023, a total of 2,203,275,159 vaccine doses have been administered [1].

Patients with COVID-19 have reported negative consequences of SARS-CoV-2 infection on a variety of bodily organs and systems, including the immunological, digestive, circulatory, hepatic, renal, and haematological systems. The impact of COVID-19 on thyroid function is uncertain. During the SARS outbreak of 2002–2003, a thorough histopathology research was conducted on the consequences of SARS-CoV infection on the thyroid gland. There have been reports of severe damage to the parafollicular cells and follicular epithelium, as well as the breakdown and exfoliation of epithelial cells into the follicle, which disrupted the follicle.

The decrease in thyroid hormone levels observed in clinical research was attributed by the authors to these modifications. Thyroid hormone levels in SARS-CoV-2 patients changed during the acute illness and convalescent period, according to earlier investigations. These results imply the necessity of thyroid hormone monitoring during clinical management of viral infections brought on by the coronavirus family. Thyroid function is, however, hardly ever mentioned or taken into account in the care of infected individuals in light of the present new SARS-CoV-2 infection.

There were no alterations in the thyroid follicular shape reported in recently published pathology data of the thyroid gland from minimally invasive autopsy performed in patients who died from SARS-CoV-2. However, lymphocytic infiltration was identified in the interstitium. It is crucial to comprehend the status of thyroid function in COVID-19 patients by evaluating the levels of thyroid hormones in these patients in order to determine the impact of SARS-CoV-2 illness on thyroid function given the mounting uncertainties surrounding the pathophysiology of the current COVID-19 disease. In order to measure the plasma levels of thyroid stimulating hormone (TSH), C-reactive protein (CRP), serum Ferritin, serum LDH, D-dimer, triiodothyronine (T3), thyroxine (T4), and COVID-19 patients as well as controls who appeared to be healthy and free of infection.

METHODS

This cross-sectional observational study was conducted in a semi-urban tertiary-care teaching hospital. A total of 100 participants comprising, RT-PCR confirmed COVID-19 patients were recruited for this study. RT-PCR confirmed COVID-19 patients (SARS-CoV-2 positive) were recruited following case confirmation and admission into the SAIMS hospital COVID-19 isolation centre.

Thyroid profile and Ferritin were performed by immune-turbidometry (E411 ROSCH). CRP is performed by mispa i2 nephrolometry method linear upto 320 mg/l ready to use reagent no sample dilution is needed and no calibration is required. D-dimer was performed by savoron alpha machine.

All patients were admitted at Sri Aurobindo Medical College & PG Institute Hospital-Indore COVID-19 isolation centre with confirmed SARS-CoV-2 infection from were included in this study after obtaining written and informed consent. The patient with history of hypothyroidism, hyperthyroidism and status unknown were divided in to three groups on the basis of High resolution computed tomography CO-RADS grading: -

group A (1-2), group B (3-4) and group C (5-6) enrolled after obtaining written informed consent. Excluded from the study were individuals Pregnant women and children <18 years of age. CRP levels were divided in 2 groups: group A with CRP <1.0 mg/dl and group B with >1.0 mg/dl. Serum LDH level were divided into 2 groups: Group A LDH level <618 lu/L AND Group B >618 lu/L. serum ferritin level Group A <291.0 ng/ml, group B >291.0 ng/ml and D-dimer group A <200mg/dl and Group B >200 mg/dl.

RESULT

Table-1 Demography

Gender	Frequency	Percentage
Male	50	50
Female	50	50
Age		
21-30	21	21
31-40	13	13
41-50	14	14
51-60	22	22
≥61	30	30
Mean Age	49.22 ± 16.68	

Table 2

CRP	T3	NO. OF PATIENTS	MEAN	P VALUE
<0.6	0.8 -2.0	37	0.188+/-1.07	-
	<0.8	11	0.659+/-1.39	
	>2.0	0	-	
>0.6	0.8-2.0	13	0.996+/-0.207	-
	<0.8	27	0.612+/-0.131	0.012
	>2.0	12	5.58+/-2.18	0.005

Table 3

CRP	T4	NO. OF PATIENTS	MEAN	P VALUE
<0.6	3.1-14.1	47	9.627+/-1.72	-
	<3.1	0	-	
	>14.1	1	14.95+/-0	
>0.6	3.1-14.1	39	8.565+/-1.751	-
	<3.1	0	-	
	>14.1	13	17.17+/-1.751	0.030

Table 4

CRP	TSH	NO. OF PATIENTS	MEAN	P VALUE
<0.6	0.5-5.0	39	1.945+/-1.20	-
	<0.5	6	0.957+/-0.301	
	>5.0	3	14.5+/-15.49	
>0.6	0.5-5.0	35	1.84+/-1.35	-
	<0.5	14	0.198+/-0.161	0.023
	>5.0	3	6.77+/-2.231	0.499

Table 5

D.DIMER	T3	NO. OF PATIENTS	MEAN	P VALUE
<200(30)	0.8 -2.0	20	1.049+/-0.128	-
	<0.8	10	0.627+/-12.32	
	>2.0	0	-	
>200(70)	0.8-2.0	30	1.053+/-0.230	-
	<0.8	28	0.625+/-0.139	0.021
	>2.0	12	5.58+/-2.1860	0.005

Table 6

D.DIMER	T4	NO. OF PATIENTS	MEAN	P VALUE
<200(30)	3.1-14.1	29	9.18+/-1.617	-
	<3.1	0	-	-
	>14.1	1	14.95	
>200(70)	3.1-14.1	57	9.13+/-1.910	-
	<3.1	0	-	-
	>14.1	13	17.17+/-1.398	0.027

Table 7

D.DIMER	TSH	NO. OF PATIENTS	MEAN	P VALUE
<200(30)	0.5-5.0	24	1.674+/-1.506	-
	<0.5	4	0.295+/-0.189	
	>5.0	2	5.327+/-0.318	
>200(70)	0.5-5.0	50	2.005+/-0.165	-
	<0.5	16	0.215+/-0.165	0.016
	>5.0	4	13.11+/-13.00	0.004

Table 8 HRCT

HRCT	T3	NO. OF PATIENTS	MEAN	P VALUE
GROUP A CORADS 1-2	LOW T3	12	0.6785+/-0.081	
	HIGH T3	0	-	
	NORMAL T3	39	1.071+/-0.186	
GROUP B CORADS 3-4	LOW T3	26	3.33+/-1.839	0.007
	HIGH T3	7	6.112+/-2.664	0.014
	NORMAL T3	10	0.995+/-0.2194	
GROUP C CORADS 5-6	HIGH T3	5	4.838+/-1.426	0.162
	LOW T3	0	-	
	NORMAL T3	1	0.823	0.327

Table 9

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HRCT	TSH	NO. OF PATIENTS	MEAN	P VALUE
GROUP A CORADS 1-2	LOW TSH	6	0.251+/-0.561	0.004
	HIGH TSH	4	12.26+/-13.43	
	NORMAL TSH	41	1.959+/-1.215	
GROUP B CORADS 3-4	LOW TSH	8	0.244+/-0.164	0.035
	HIGH TSH	2	7.425+/-2.72	
	NORMAL TSH	33	1.822+/-1.348	
GROUP C CORADS 5-6	HIGH TSH	0	-	
	LOW TSH	6	0.193+/-0.206	0.004
	NORMAL TSH	0	-	

Table 10

HRCT	TSH	NO. OF PATIENTS	MEAN	P VALUE
GROUP A CORADS 1-2	LOW T4	0	-	
	HIGH T4	1	14.95	0.050
	NORMAL T4	50	9.60+/-1.736	
GROUP B CORADS 3-4	LOW T4	0	-	
	HIGH T4	8	17.077+/-1.480	0.002
	NORMAL T4	35	8.633+/-1.686	
GROUP C CORADS 5-6	HIGH T4	5	17.328+/-1.408	0.049
	LOW T4	0	-	
	NORMAL T4	1	11.35	

Table 11 Sick Euthyroid Syndrome

LOW T3 (38)	CRP	NO OF PATIENTS	
	<0.6	12	
	>0.6	26	0.009
LOW T3 (38)	LDH		
	<618	19	0.813
	>618	3	
LOW T3 (38)	FERRITIN		
	<291	8	
	>291	14	0.005
LOW T3 (38)	D.DIMER		
	<200	7	
	>200	15	0.043
LOW T3	HRCT		
	CORADS 1-2	6	
	CORADS 2-4	20	
	CORADS 5-6	0	

DISCUSSION

Thyroid dysfunction has been linked to SARS-CoV-2 infection in several organ systems. Although it has been postulated that SARS-CoV-2 may target the thyroid gland, the mechanism and its impact on thyroid function remain unknown. Therefore, the objective of the current study was to measure plasma levels of T3, T4, and TSH in the participants. Data of 100 covid RT PCR positive patients were analysed.

In our study mean age of 49.22±16.68 years with mean age between men was 50.42 years and females were 48.02 years. Dabas, et al 2021 study, the mean age was 53.85 years[2]. Ahn J, et al 2021 study, the patients mean age was 64.3± 16.8 years, and 52.1% of patients were men[6]. Wang w et al 2020, the mean age of 37 +/- 14.3 years[4].

The thyroid profile t3, t4, TSH of these patients was compared to inflammatory markers CRP, Sr. LDH, Sr.ferritin, D.dimer. It was observed that about out of 100 patients, majority 52(52%) of patients were having normal thyroid function levels with mean T3 Levels of 0.9 +/- 0.22, T4 levels of 9.53+/- 1.78 and TSH of 1.89 +/- 1.22. with only 17% of patients were having raised CRP levels with mean of 2.24 +/-

1.11. mean LDH of 290, Ferritin 226.6 and D.dimer of 1047. In Ahn J, et al 2021, of the 119 patients, 76 (63.9%) were euthyroid and non presented with overt thyroid dysfunction[6]. In Dabas, et al 2021 study, 33% were having normal thyroid profile[2]. In Bernard khoo, et al 2021 study, 86.5% of patients were euthyroid[3].

In our study, low T3 levels was the most common abnormality observed. 38 patients (38%) were having low T3 levels. Out of these patients 27 patients having raised CRP levels and remaining 11 patients with normal CRP levels. In Sen et al, 2020 commonest abnormality was low TSH levels 18.33%[5].

Clinical Values For Thyroid Dysfunction In Covid 19 Patients

In our study, we observed clinical value of thyroid dysfunction in 38% of the patients which were associated with raised inflammatory markers and high-resolution CT chest scans. Of these 38% of patients 27% of these patients were having low T3 levels with correlation with raised inflammatory markers with mean CRP levels 2.10 ± 0.5 , LDH 364.3 ± 289.6 , ferritin 530.4 ± 500.6 and D.dimer 1314.6 ± 1305 . Such pattern represents non thyroid illness aka sick euthyroid syndrome or low T3 syndrome. In sen et al 2020 study, acute severe illness follows similar pattern of low total and unbound T3 levels as commonest abnormality[5]. Ahn J, et al 2021 study, 18.5% patients had low T3 levels and it was the most common manifestation among patients[6].

CONCLUSION

Although there was a preponderance of euthyroidism was observed. In our study, Sick euthyroid was seen in the majority of patients hospitalized with COVID 19. Low T3 levels was associated increased inflammation and lung parenchymal involvement in high resolution CT chest scan and was associated with diseases severity. Consequently, it is important to monitor thyroid function both during and after COVID-19 treatment

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