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ORIGINAL ARTICLE

Clinical Severeity of Covid-19 Affected by Thyroid Disease

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ABSTRACT

Objective: The current study's goal is to determine if thyroid disease can predict the severity of COVID-19.
Study Design: Prospective Study
Place and Duration: THQ kotmomin district Sargodha, Punjab Medical College. March 2021-SEP 2021
Methods: This research included 122 patients of both sexes. Patients ranged in age from 20 to 75. In order to obtain demographic data, all patients completed a permission form in which they said that they were willing to have this information used for research purposes. A PCR test was performed on each patient to establish the presence of a pandemic illness. Two equal groups, I and II, were created for the patients. Patients with symptoms in group I comprised of 61 patients, while group II had 61 patients without symptoms. Thyroid-stimulating hormone (TSH), thyroid peroxidase antibody (TPA), thyroid free triiodothyronine (FT3), and thyroglobulin antibody were all tested for in the participants' blood (TGA). SPSS 24.0 edition was used for the whole data set to be analysed.
Results: There was no any significant difference of age and BMI among both groups. Majority of the patients among both groups 40 (65.6%) and 39 (63.9%) were males. 35 (55.7%) of the patients in group I had severe disease, whereas 20 (32.8%) of those in group II had severe infection. Group I patients exhibited significantly lower levels of free thyroxine (FT4) and free triiodothyronine in their blood than the rest of the patients (FT3). The levels of IL-6 in group I were significantly greater than in group II. Among the 10 (16.4%) people in group I, had an overt thyroid problem, compared to 5 (8.2 % in group II . 17 (27.9%) instances of thyroid nodules larger than 1cm were detected in group I, whereas 6 (9.8%) cases of nodules larger than 1cm were found in group II. Group I had a considerably higher mortality rate, as shown by a p value of 0.05.
Conclusion: Thyroid hormone abnormalities were more common in very sick COVID19 patients studied in this investigation. COVID19 patients' FT3 levels at the time of hospital admission may serve as a prognostic indication. Nodules on the thyroid may be a symptom of a severe form of COVID-19.

INTRODUCTION

As a result of the rising number of cases and the fast development of SARS-CoV-2, Coronavirus Disease 2019 (COVID-19) has become a global health burden impacting people of all ages [1.] To make more effective use of available resources in order to minimise the disease's current symptoms and severity, finding risk indicators that may predict patient outcomes is critical during this current epidemic of COVID-19. [2]

People who are healthy may get infected by coughing or exhaling, which can transmit COVID 19 respiratory droplets to them. Symptoms of COVID-19 include a dry cough and a fever, which are both prevalent. It is typical for little and increasing symptoms to be present here. Approximately 80% of those who are diagnosed with the condition recover without the need for any special therapy or interventions. COPD is more likely to progress to a more severe form in people over the age of 65, as well as those who have underlying diseases such as hypertension, cardiac difficulties, or diabetes [3].

Diabetes, hypertension, coronary artery disease, and stroke were all shown to be prevalent in COVID-19 individuals [4, 5]. Aside from that, diabetes types 1 and 2 may enhance the chance of acquiring COVID-19 as a result of immunological dysfunction [5, 6]. Consequently, it is unclear if COVID-19 and thyroid issues are related in any manner. BACKGROUND:

People all around the globe are being affected by COVID-19's long-term affects on the body's natural physiological equilibrium, which has been connected to a range of long-term health repercussions on the body. Researchers are revealing the intricacies and severity of human organ systems such as the respiratory and digestive, circulatory and immunological, renal, and hepatic systems at an alarming pace, as well as the cardiovascular and immune systems. Thyroid dysfunction and its underlying processes are becoming more understood as the influence of COVID-19 on human thyroid function becomes more widely recognised. Also of note is the fact that the thyroid gland produces significant amounts of both ACE2 and transmembrane peptidase serine 2 (TMPRESS2), which is even greater than the levels previously described for the lungs. When these two proteins are present, the virus is able to penetrate human cells and cause infection. [7,8]

Thyrotropin-releasing hormone (TRH), thyroid stimulating hormone (TSH), free triiodothyronine (FT3), and free thyroxine are some of the hormones involved in the hypothalamus-pituitary-thyroid axis. (FT4). The association between thyroid gland function and COVID-19 is currently unknown. Patients with COVID-19 were shown to be 27.52 percent more likely than healthy controls to have thyroid illness in Runmei Zou's 2020 research. [9] This figure was 22.2 per cent in a study of patients in the UK with extensive thyroid follicular epithelial cell destruction. [10] Thyroid function and thyroid hormone levels are thought to be affected directly by COVID-19, which acts on the hypothalamus-pituitary-thyroid axis. Thyroid glands may also be affected by cytokines in autoimmune illnesses. [11] In patients with normal FT3 and FT4 levels, TSH levels have been reported to have a negative correlation with COVID-19 mortality. [12] TSH and FT4 levels were low in individuals with verified COVID-19-positive status during hospitalisation, but reverted to normal levels after the patient recovered. [13] Meta-analysis by M. Llamas found that COVID-19 severity is strongly linked to the amount of FT3 in the bloodstream. [14]

A major objective of the present investigation is to establish if thyroid illness may predict the severity of COVID-19. Individuals with COVID19 who had thyroid nodules were compared to patients with COVID19 who did not have any thyroid nodules as part of this research.

MATERIAL AND METHODS

This prospective study was conducted at THQ kotmomin district Sargodha, Punjab Medical College and comprised of 122 patients had coronavirus infection. All patients completed a permission form stating their approval to the collection of their demographic data, which included their age, gender, BMI, location of residence, educational attainment, and general socioeconomic position. Patients with heart and renal failure, as well as those who did not provide written permission, were not included in this research.

Even though the patient's nasopharyngeal swab test resulted in a negative result, a real-time reverse transcription polymerase

chain reaction (RTPCR) on samples collected from his nose and throat proved that he had COVID19.

Fasting blood samples were obtained on the first morning of a patient's hospital stay, as is routine protocol at this facility. A complete blood count was performed as a precaution, and the following tests were performed: glucose (urea), creatinine, AST, ALT, albumin, ferritin, C-reactive protein (CRP), D-dimer, and thyroid stimulating hormone. The following criteria were utilized in order to categorize the thyroid hormone values obtained from patients: According to the findings of this research, both overt and subclinical thyrotoxicosis had TSH levels that were much lower than the reference ranges. A patient was regarded to have overt hypothyroidism if his or her TSH, FT4 and/or FT3 blood values were outside of the acceptable reference limits. FT4 and FT3 levels were judged to be within normal limits in the face of low or high TSH levels, and this was thought to suggest subclinical thyroid impairment. Patients were divided into two equal groups, denoted as I and II, for further evaluation. 61 patients with symptoms were included in group I, whereas 61 instances with no symptoms were included in group two.

To examine the whole set of data, we employed the SPSS 22.0 version. For categorical data, we utilised standard deviation, frequencies, and percentages as measures.

RESULTS

There was no any significant difference of age and BMI among both groups. Majority of the patients among both groups 40 (65.6%) and 39 (63.9%) were males. In group I 28 (45.9%) had urban residency and in group II 27 (44.3%) patients were from urban areas. Majority of the patients were illiterate in both groups and had poor socioeconomic status.(table 1)

Table 1: Baseline details of enrolled cases

Variables	Symptomatic	Asymptomatic
Mean age (years)	48.13±6.35	47.7±15.35
Mean BMI (kg/m^2)	25.9±11.34	24.10±7.61
Gender		
Male	40 (65.6%)	39 (63.9%)
Female	21 (34.4%)	22 (36.1%)
Residential Area		
Urban	28 (45.9%)	27 (46.7%)
Rural	33 (54.1%)	34 (53.3%)
Literate		
Yes	25 (40.9%)	28 (45.9%)
No	36 (59.1%)	33 (54.1%)
Poor Socio-economic status		
Yes	45 (73.8%)	44 (72.1%)
No	16 (26.2%)	17 (27.9%)

35 (55.7%) of the patients in group I had severe disease, whereas 20 (32.8%) of those in group II had severe infection.(fig 1)

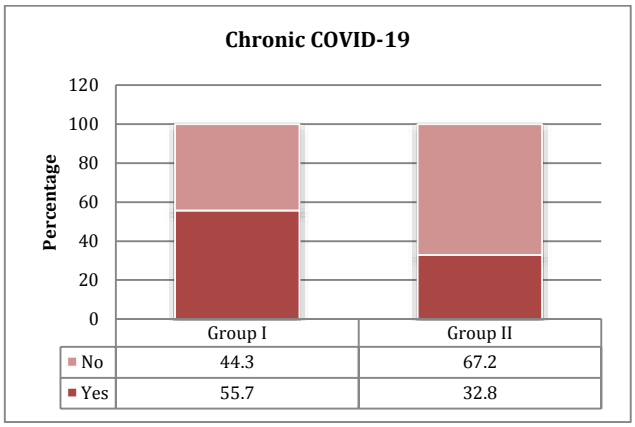

Figure 1: Disease severity among both groups

Group I patients exhibited significantly lower levels of free thyroxine (FT4) and free triiodothyronine in their blood than the rest of the patients (FT3). The levels of IL-6 in group I were significantly greater than in group II. (table 2)

Table 2: Comparison of thyroid functions

Variables	Symptomatic	Asymptomatic
Thyroid Function		
TSH (mIU/L)	3.1 ±5.16	4.14±7.45
FT4 (mcg/dL)	5.3±7.19	8.7±4.41
FT3 (ng/dL)	77.19±8.51	112.3±7.51
IL-6 (pg/mL)	18.6±4.35	9.7±12.41

Among the 10 (16.4%) people in group I, had an overt thyroid problem, compared to 5 (8.2 %) in group II . 17 (27.9%) instances of thyroid nodules larger than 1cm were detected in group I, whereas 6 (9.8%) cases of nodules larger than 1cm were found in group II. (table 3)

Table 3: Comparison of thyroid disorders

Variables	Symptomatic	Asymptomatic
OTD		
Yes	10 (16.4%)	5 (8.2%)
No	51 (83.6%)	56 (91.8%)
Thyroid nodules size		
>1cm	17 (27.1%)	6 (9.8%)
<1cm	44 (72.9%)	55 (90.2%)

Group I had a considerably higher mortality rate, as shown by a p value of 0.05.(fig 2)

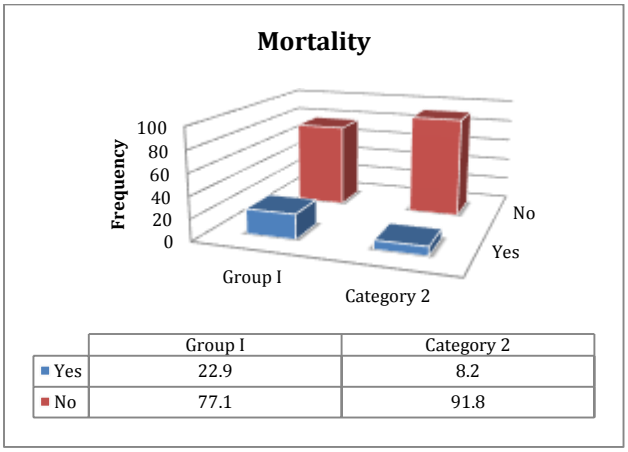

Figure 2: Comparison of mortality among both groups

DISCUSSION

The COVID-19 virus and thyroxine seem to have a limited association in the literature at this time. The thyroid gland and viruses have been shown to interact through hormones and signalling molecules in previous research. [15] However, it is still unknown how the COVID-19 virus affects thyroid hormone levels and what the underlying mechanism is.

In our study 122 patients had corona virus disease were included. Patients were categorized into two groups symptomatic and asymptomatic. There was no any significant difference of age and BMI among both groups. Majority of the patients among both groups 40 (65.6%) and 39 (63.9%) were males. In group I 28 (45.9%) had urban residency and in group II 27 (44.3%) patients were from urban areas. Majority of the patients were illiterate in both groups and had poor socioeconomic status. These findings were comparable to the previous studies.[16,17] 35 (55.7%) of the patients in group I had severe disease, whereas 20 (32.8%) of those in group II had severe infection.

Patients with critical COVID-19 symptoms had lower TSH levels than those without symptoms, according to our findings.

Furthermore, patients with COVID-19 had significantly elevated TT3 levels at follow-up with little or no effect on TT4 levels. This complicates things further. While hypothyroidism affects 4.1 percent of the population in Pakistan, hyperthyroidism and subclinical hyperthyroidism affect 5.1 and 5.8 percent of the population, respectively. [20] Despite the fact that hyperthyroidism is a rare illness in Pakistan. However, our prevalence appears to be far greater than the prevalence of both disorders, which are both 0.7% in Europe and 0.5% in the United States, while the prevalence of subclinical and overt hyperthyroidism as well as hypothyroidism is comparable in our closest neighbour India at 1.6% and 1.3%, respectively. [18,19]

Patients with COVID-19 had reduced TSH levels, according to one research. Both of these hypotheses [20] potentially account for the situation. SARS-COV-2 is capable of directly damaging hair follicles. Another research, on the other hand, showed that pituitary malfunction, rather than injury to thyroid tissue, may be to blame for the findings. The term sick euthyroid refers to a condition that arises in severely ill people who have indications of hypothyroidism. This condition is caused by a variety of causes, including variations in TSH synthesis, binding to transport proteins, and thyroid hormone absorption in the peripheral circulation. Therapeutic use of thyroid hormones has minimal influence on this pathological response to acute illness in people with sick euthyroidism. There have been a number of research on COVID-19's influence on euthyroid disease.[21,22]

Among the 10 (16.4%) people in group I, had an overt thyroid problem, compared to 5 (8.2 %) in group II . 17 (27.9%) instances of thyroid nodules larger than 1cm were detected in group I, whereas 6 (9.8%) cases of nodules larger than 1cm were found in group II. To put things in perspective, the effects of COVID-19 seem to have had minimal influence on the populations of Pakistan and nations where it has ravaged populations. COVID-19's long-term repercussions for critically sick patients, especially in terms of follow-up, seem to be overlooked It is possible for an elderly patient to misunderstand TT3-related symptoms (such as weariness, dizziness, and raised heart rate) as the body's response to a viral disease. There are significant similarities between the signs and symptoms of thyroid storms and cytokine storms in extremely unwell individuals. [23]. During the SARS pandemic of 2002, postmortem investigations of dead patients' thyroid tissue revealed a precedent for the impact of a previous coronavirus on the thyroid. [24] It's possible that an unrelated condition's immunogenic and hormonal overlap may lead to thyroid autoimmunity by accident. In group I, the p value was less than 0.05, which suggested that mortality rates were considerably greater when corticosteroids were administered for treatment of COVID-19.

COVID-19 may cause thyroid problems as one of numerous symptoms. COVID-19 is a condition that may benefit from a thyroid function test as part of the diagnostic process. In this patient cohort, the severity of COVID-19 is inversely associated to the prevalence of T3 syndrome. Supplementing with T3 may improve the prognosis for those who are terminally sick, but its effectiveness and safety are still being investigated. Patients with hyperthyroidism who get RDV or ATDs in the hospital run the risk of suffering an abrupt liver damage. It's possible that dexamethasone and heparin, which both affect thyroid hormone synthesis and measurement, would mislead doctors into diagnosing hypothyroidism. [25]Group I had a considerably higher mortality rate, as shown by a p value of 0.05.[26,27]

Asymptomatic or mildly ill COVID-19 patients may be cared for in their own homes. A thyroid function test should be conducted if a treatment change is necessary or if symptoms of thyroid dysfunction are noticed.[28]

CONCLUSION

This study came to the conclusion that overt thyroid hormonal abnormalities were more prevalent in severely ill COVID19 patients. It is possible that the FT3 level at the time of hospital admission is a prognostic indicator in COVID19 patients. Symptoms of severe COVID-19 disease may include thyroid nodules.

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