ISSN 2664-3987 (Print) & ISSN 2664-6722 (Online)
**South Asian Research Journal of Medical Sciences**
*Abbreviated Key Title: South Asian Res J Med Sci*

**| Volume-3 | Issue-6 | Nov-Dec -2021 |** **DOI: 10.36346/sarjms.2021.v03i06.005**

**Original Research Article**

# Interaction of Thyroid Hormone Levels and Vital Functions of COVID 19 Infected Patients

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**Article History**
Received: 29.10.2021
Accepted: 03.12.2021
Published: 12.12.2021

**Abstract:** ***Introduction***: Covid 19 disease is considered a common public health problem and one of the leading causes of death. The clinical feature of this disease is that thyroid hormone levels are considered to be critically important in demonstrating vital functions. The effect of hormone levels on vital functions was investigated. ***Material and method***: The patients who were treated in the intensive care unit between March 2020-2021 were examined and written informed consent was obtained from the patients. The thyroid hormone levels of the patients in the intensive care units were compared statistically and its effect on clinically important values was examined. ***Results***: A total of 204 patients were included in the study. Thyroid hormone levels and infection parameters of the patients admitted to the intensive care unit were compared with their clinical features. Free t3 and free t 4 levels were found to be effective on mortality. ***Conclusion****:* It was supported by our study that fT3 and fT4 levels were lower in the group of patients who lost their lives in patients with severely severe COVID-19 infection. It has been seen that these hormone levels can be shown as a mortality indicator in the COVID-19 patient group, and we believe that prospective analyzes with additional studies can be illuminating on the subject.

**Keywords:** COVID-19, Mortality, throid hormone levels.

## INTRODUCTION

The COVID-19 disease and its complications are a pandemic that disrupts public health systems and causes socioeconomic constraints. Its clinical form has a wide spectrum that can progress from asymptomatic to death [1]. The direct effects of virus infection, as well as the involvement of inflammatory cytokines and the complement system, can cause multiple organ failures [2]. The COVID-19 virus, which binds through the angiotensin converting enzyme-2 (ACE-2) receptor in the human body through the indirect damage it plays, clings to the thyroid tissue like many organs in the human body with these receptors [3]. The hypothalamus-pituitary-thyroid axis is a system that is thought to be potentially affected by COVID-19 infection, and secondary thyroid dysfunctions occur due to this damage [4]. Thyroid dysfunctions may occur during COVID-19 infection, and patients with thyroid dysfunction are thought to have this disease more severely [5]. It can even cause lifelong damage to the thyroid gland through inflammatory cytokines [6].

The Covid 19 pandemic has caused many serious illnesses and deaths all over the world and has shaken health systems. There is an urgent need to determine effective parameters in covid 19 mortality. Our aim is to investigate whether thyroid function tests, which can be easily studied in many centers, are effective in covid 19 mortality and to contribute to the literature on this subject.

## MATERIAL METHOD

Local ethics committee approval was obtained. Our hospital diagnosed with covid 19 within 1 year (March2020-March 2021) (Computerized thorax tomography accompanied by complaints such as fever, weakness, cough and shortness of breath), determination of diagnostic imaging findings of covid 19 infection by the radiologist and

polymerase chain reaction and nucleic acid in the sample taken from the respiratory tract. acid determination) and the files of the patients who were treated in the anesthesia intensive care units of our hospital were scanned. The blood results observed after he was taken to the anesthesia intensive care unit were examined and the results were recorded. Patients whose TSH, free T3 (fT3) and free T4 (fT4) were studied were included in the study. The files of the patients were reviewed. Patients with missing data were excluded from the study. A total of 204 patients were included in the study. In order to investigate the effect of thyroid function tests on mortality, patients who died were classified as Group1 and patients discharged from the intensive care unit were classified as Group2. Demographic data and laboratory results of the patients were recorded. The groups were compared statistically.

Despite 100% oxygen support (with 5 lt/min oxygen from the reservoir mask), patients with continuing respiratory distress (respiratory rate (SS) >20 and oxygen saturation (spo2) <90) were admitted to the intensive care unit, and when they came to the emergency room, emergency endotracheal intubation was performed. It was seen that the patients who underwent invasive mechanical ventilation support were taken to the intensive care unit.

## STATISTICAL ANALYSIS

Data analysis was done using SPSS v20 program. Categorical variables were given as numbers and percentages, and numerical variables as mean and standard deviation. The distribution of categorical variables between groups was analyzed with the CI-Square test. The suitability of the numerical variables to the normal distribution was examined by the Kolmogrof-Smirnov test and the graphing method. Mann Whitney-U was used for comparisons of non-normally distributed numerical variables, and t-test was performed for those with normal distribution and homogeneous data. $P<0.05$ was considered statistically significant. Logistic regression analysis was performed to examine which variables affected the discharge and mortality of the patients.

## RESULTS

There were 134 patients in group 1 and 70 patients in group 2. The mean age of the patients in Group 1 was 75±11 years, while the mean age of the patients in Group 2 was 70±10 years. Demographic data and laboratory results of the patients are summarized in Table 1. In the regression analysis, age, FT3 and FT4 were found to be associated with mortality (Table 2).

## DISCUSSION

The devastating effects of the COVID-19 pandemic, which are life-threatening and cause many changes in human life with isolation and restrictions, increase the importance of protective measures and clinical features one more time. The economic and social effects of this pandemic cannot be ignored, can give you an idea.

It is known that those with an active and progressive chronic disease are greatly affected by this infection. In addition, a statistical decrease in fT3 and tsh values was shown in the euthyroid patient group in controls [7, 8] In some studies, cases of thyroiditis associated with COVID-19 have been reported. These studies show that an inflammatory response may develop in the thyroid gland, especially in individuals with increased interleukin-6 (IL-6) levels or severe disease [9-11]. Abnormal Thyroid function tests levels are defined in the range of 44% to 94% in patients with COVID-19. The most common abnormality has been shown to be a decrease in TSH levels [12].

The effects of thyroid hormones on lipid and carbohydrate metabolism are known. They also take part in the regulation of many organ functions [13]. In a study, it was reported that individuals with existing thyroid hormone disorders were not a predisposing factor for contracting COVID-19 disease [14]. However, it was counted among the risk factors for mortality in this study and another study [14, 15].

In our study, intensive care patients were divided into two groups as those who lost their lives and those who did not die. The genders were similar between the groups. It was observed that the mean age of group 1 patients who died was older. Again, higher CRP, procalcitonin and IL-6 levels in group 1 patients indicate that cytokine storm due to infection and COVID-19 is more severe in this group of patients. In addition to the high infection parameters in group 1 patients, thyroid function tests showed that fT3 level was statistically lower than the other group patients. On the other hand, fT4 and TSH levels were found to be similar between the groups and there was no statistical difference. However, in the regression analysis results, fT3 and fT4 levels were found to be significantly lower in group 1 patients who lost their lives. (sig: ft3: 0.32, fT4: 0.33), patients with a history of thyroid dysfunction were excluded from the study. These results point to lower fT3 and fT4 results in patients who died in intensive care patients. In addition, changes in thyroid hormone levels may occur due to the binding of carrier proteins and reducing their target organ effects [16, 17].

## CONCLUSION

It was supported by our study that fT3 and fT4 levels were lower in the group of patients who lost their lives in patients with severely severe COVID-19 infection. The limitations of the study include the relatively small group of patients and the follow-up of thyroid hormone levels after the intensive care unit. It has been seen that these hormone levels can be shown as a mortality indicator in the COVID-19 patient group, and we believe that prospective analyzes with additional studies can be illuminating on the subject.

**Table-1: Average of age, gender, length of stay and laboratory results of the groups**

| | GROUP 1 (N:134) | GROUP2 (N:70) | P |
|---|---|---|---|
| Age | 75±11 | 70±10 | 0,00 |
| F/M | 54/80 | 30/40 | 0,72 |
| Duration of Hospital | 11±8 | 14±14 | 0,26 |
| Albumin g/dl | 3±0,6 | 3±0,3 | 0,10 |
| Leukocyte cells/$mm^3$ | 11±5 | 10±9 | 0,00 |
| Neutrophil cells/$mm^3$ | 10±5 | 8±3 | 0,00 |
| Lymphocyte cells/$mm^3$ | 0,8±0,8 | 1,1±2 | 0,06 |
| D-Dimer ng/ml | 2218±3054 | 2758±6320 | 0,26 |
| CRP mg/l | 148±91 | 111±73 | 0,00 |
| Ferritine ng/ml | 813±591 | 585±465 | 0,01 |
| Procalcitonine ng/ml | 5,7±15 | 0,4±1,4 | 0,00 |
| İGA ng/ml | 2,9±3,0 | 11±48 | 0,55 |
| IL 6 ng/ml | 446±759 | 129±344 | 0,00 |
| Free T3 ng/L | 1,4±0,5 | 1,7±0,5 | 0,00 |
| FreeT4 ng/dL | 1,0±0,3 | 1,2±0,4 | 0,10 |
| TSH ulU/mL | 1,0±1,2 | 1,0±1,4 | 0,72 |

Group 1: patients who died. Group 2: patients discharged from intensive care. N: number of patients. F / M: Female to male ratio. CRP: C-Reactive protein. TSH: Thyroid stimulating hormone.

**Table-2: Regression analysis of variables.**

| | B | STANDARD ERROR | BETA | SİG |
|---|---|---|---|---|
| AGE | -,007 | ,003 | -,169 | ,049 |
| ALBUMIN | -,005 | ,007 | -,060 | ,478 |
| LEUKOCYTE | ,008 | ,007 | ,131 | ,258 |
| NEUTROPHIL | -,018 | ,012 | -,193 | ,132 |
| LYMPHOCYTE | ,044 | ,026 | ,136 | ,093 |
| D-DIMER | 1,073E-005 | ,000 | ,100 | ,223 |
| CRP | ,000 | ,000 | -,078 | ,391 |
| FERRITINE | -2,620E-005 | ,000 | -,031 | ,724 |
| PROCALCITONINE | -,003 | ,004 | -,082 | ,394 |
| IGA | ,002 | ,001 | ,120 | ,145 |
| IL-6 | -2,495E-005 | ,000 | -,034 | ,693 |
| FT3 | ,152 | ,070 | ,193 | ,032 |
| FT4 | ,236 | ,109 | ,180 | ,033 |
| TSH | ,025 | ,032 | ,068 | ,438 |

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**CITATION:** Harun Tolga Duran & Ulku Ince (2021). Interaction of Thyroid Hormone Levels and Vital Functions of COVID 19 Infected Patients. *South Asian Res J Med Sci, 3*(6): 78-81.