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Fatigue post COVID-19 infection recovery, is related to thyroid dysfunction?

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Abstract

This study evaluate possibility of thyroid dysfunction in patients present with fatigue after fully recovery from COVID-19 infection. 51 patients were involved in this study that was performed within eleven months from August 2022 to July 2023. First group 25 patients with history of post COVID-19 admission to Margan hospital (Babylon governorate, Iraq) at least 3 days with at least 1 month with full recovery of active disease (no fever no sweating) presented with fatigue & weakness with no other explanation as DM , pulmonary fibrosis , myopathy (steroid), and second group include 26 patients with no history of admission or home treatment for COVID-19 with fatigue & weakness with same medical exclusion. TSH & fT4 were done by the Cobas e 411 analyzer which is a fully automated analyzer from Roche company. 51 patients with history of fatigue after full recovery of active COVID-19 infection, 22 (about 43%) were male and 29(about 57 %) were female. 1st group 25 patients with history of admission to hospital with age range between 45 and 79 years old and 2nd group 26 patients with no such history with age range between 45 and 81 years old. Thyroid stimulating hormone (TSH) is significantly elevated (more than 5 uIU/mL**)** in five patients, three of first group and in two patients of second group. So thyroid dysfunction affect patient with hospital admission more. Subclinical hypothyroidism detected in four patients and one patient with low fT4 and elevated TSH (hypothyroidism). So, the abnormal thyroid function test was found in 5 patients (9.8%). In this study we detect the following conclusions; Minority of patients present with fatigue after fully recovery from COVID-19 infection, have thyroid dysfunction (statistically not significant). According to this study the fatigue after full recovery of active COVID-19 infection, affect middle and old but not young age group. The fatigue after full recovery of active COVID-19 infection, affect female more than male. Abnormal Thyroid function tests (elevated TSH) affect patients with hospital admission more than patients with no history of admission or home treatment for COVID-19 infection. Most likely thyroid dysfunction in patients present with fatigue after fully recovery from COVID-19 infection is elevated TSH level which mostly due to sub clinical hypothyroidism.

Keywords: COVID-19, Fatigue, Thyroid

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Introduction

On 2019, many cases of idiopathic chest infection were reported by the World Health Organization in Wuhan, China. Later on coronavirus disease (COVID-19) confirmed as a cause and world wide spread of this virus as pandemic occurred [1]. The harmful effects of COVID-19 infection can affect several organ in the body in different pathogenesis include immune response disturbance and damage of host cells also there are lymphopenia and increase cytokines level. This lead to severe acute respiratory syndrome [2]. The virus enters parenchyma of the lung and ultimately, spike proteins of the virus connect to angiotensin-converting enzyme 2 (ACE2), which act as receptor facilitate the entry of virus to different cells in the body and particularly pneumocytes [3,4]. ACE2-expressing cells present in several endocrine organs particularly testis followed by thyroid gland [5,6]. So, the pituitary–thyroid axis is considered as a susceptible site of COVID-19 effect, and pituitary disorder has been detected as cause of secondary hypothyroidism [7]. A study by Rotondi et al. also suggested the thyroid as an important target for SARS-CoV-2, where the mRNA is encoded by thyroid follicular cells for ACE2 receptors [8]. The Viral infection and through the inflammatory responses can lead to significant effect on thyroid function [9]. The alteration in levels of iodothyronine deiodinase, secretion of TSH, connection to thyroid binding proteins, thyroid hormone transport to targeted tissues, and alterations in activity of thyroid hormone receptor are suspected to be responsible for to the variations in thyroid hormone levels in patients with COVID -19 infection, but this needs more investigations [10]. From other hand, generally the effect thyroid hormones on immune cells is poorly understood. Innate and adaptive immune responses are regulated by effect of thyroid hormones [11].The production of cytokines is activated by T4 and T3; this lead to a “cytokine storm”, which associated with sever COVID-19 infection and represent important factors of morbidity and mortality [12,13].

Patients and methods

51 patients with history of COVID-19 infection were involved in this cross-sectional study that was performed within eleven months from August 2022 to July 2023. We divide the patients into two group, first group 25 patients with history of admission to Margan hospital (Babylon governorate, Iraq) at least 3 days with at least 1 month with full recovery of active

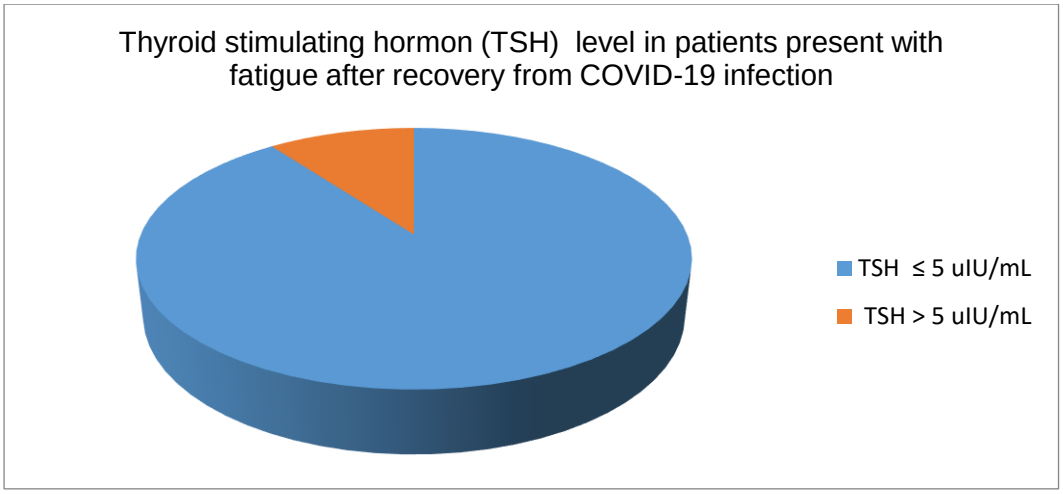
disease (no fever no sweating) presented with fatigue & weakness with no other explanation as diabetes mellitus, pulmonary fibrosis or myopathy (steroid induced) and second group include 26 patients with no history of admission or home treatment for COVID-19 with fatigue & weakness with same medical exclusion. TSH & fT4 were done by the Cobas e 411 analyzer which is a fully automated analyzer from Roche company, where normal range of fT4 is 10-35 pmol/L and normal range of Thyroid stimulating hormone (TSH) is 0.46 - 43 uIU/mL and hypothyroidism when TSH more than 5 uIU/mL. So, regarding patients in this study TSH more than 5 uIU/mL considered abnormal.

Results

This study includes 51 patients present with fatigue after full recovery of active COVID-19 infection, 22 (about 43%) were male and 29(about 57 %) were female. Admission to hospital was needed in 25 patients with age range between 45 and 79 years old and 2nd group 26 patients with age range between 45 and 81 years old with no history of hospital admission. Thyroid stimulating hormone (TSH) is elevated significantly (more than 5 uIU/mL) only in five patients from total 51 patients (statistically insignificant) , three patients in the group with history of admission and in two patients of second group So thyroid dysfunction affect patients with hospital admission more. Subclinical hypothyroidism detected in four patients and one patient with low fT4 and elevated TSH (hypothyroidism). So, the abnormal thyroid function test that may be the predisposing factor of fatigue, was found in 5 patients (9.8%).

Study variables	Patients with history of hospital admission	Patients with no history of hospital admission	P-value
Gender -male -female Total	9 (36.0) 16 (64.0) 25 (100.0)	13 (50.0) 13 (50.0) 26 (100.0)	0.313
Age - Less than 60 years - More than 60 years Total	 14 (56.0) 11 (44.0) 25 (100.0)	 11 (42.3) 15 (57.7) 26 (100.0)	0.328
Abnormal TSH (elevated) Normal Total	3 (12.0) 22 (88.0) 25 (100.0)	2 (7.7) 24 (92.3) 26 (100.0)	0.668
Abnormal fT4 (decreased) Normal Total	0 (0.0) 25 (100.0) 25 (100.0)	1 (3.8) 25 (96.2) 26 (100.0)	1.000

P-value ≤ 0.05 was significant. This table shows the association between study variables and fatigue occurrence in patients after recovery from COVID-19 infection.



Discussion

Many studies mention that COVID-19 infection may be possible factor lead to thyroid dysfunction but till now this relation is not proved [14]. This cross sectional study involves 51 patients present with fatigue after fully recovery from COVID-19 infection with no other explanation of this fatigue as diabetes mellitus, pulmonary fibrosis or steroid induced myopathy. The characteristic features of hypothyroidism include fatigue and inactivity. We evaluate the thyroid function as possible cause of lethargy. The authors recommend performing larger studies for assessment of fatigue and lethargy that affect patients after fully recovery from COVID-19 infection. Also, in this patient thyroid function evaluation is important and need to involved thyroid imaging and autoantibodies assay

Conclusions

According to this study the fatigue after full recovery of active COVID-19 infection, affect middle and old but not young age group. The fatigue after full recovery of active COVID-19 infection, affect female more than male. Minority of patients present with fatigue after fully recovery from COVID-19 infection, have thyroid dysfunction (statistically not significant). Abnormal Thyroid function tests (elevated TSH) is affect patients with hospital admission more than patients with no history of admission or home treatment for COVID-19 infection. Most likely thyroid dysfunction in patients present with fatigue after fully recovery from COVID-19 infection is elevated TSH level which mostly due to sub clinical hypothyroidism.

Abbreviations

Not applicable

Declarations

Ethics approval and consent to participate

Funding

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Competing Interests

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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