

# Postural Tachycardia Syndrome and Anxiety Disorder in Post-SARS-CoV-2- A Case Report

Sakthi Thava Priya C<sup>1,\*</sup>, Dhakchinamoorthi Krishna Kumar<sup>1</sup>, Vijayan Abhilash<sup>1</sup>, Divya V<sup>3</sup>, Sharnita P<sup>4</sup>, Sellappan Mohan<sup>2</sup>

<sup>1</sup>Department of Pharmacy Practice, Karpagam College of Pharmacy, Coimbatore, Tamil Nadu, INDIA.

<sup>2</sup>Department of Pharmaceutics, Karpagam College of Pharmacy, Coimbatore, Tamil Nadu, INDIA.

<sup>3</sup>Department of Pharmacy Practice, PSG College of Pharmacy, Coimbatore, Tamil Nadu, INDIA.

<sup>4</sup>Department of Psychiatry, Karpagam Faculty of Medical Sciences and Research, Coimbatore, Tamil Nadu, INDIA.

## ABSTRACT

Severe acute respiratory syndrome of coronavirus 2 (SARS-CoV-2) is a contagious deadly virus that had a significant impact on public health. It also causes a major impact on the lung complication with other comorbid disorders, such as cardiac and psychological conditions, which also leads to significant health and psychological burden to the patients. The restoration of the mental conditions among SARS-CoV-2 infected individuals becomes more essential. A 56-year-old female patient was admitted with chief complaints of dry cough and fever in the casualty care unit. She was diagnosed with positive SARS-CoV-2 infection and immediately admitted to covid care isolation wards. She was managed with antiviral drugs and other supportive care. Later, discharged with prednisone, oral anticoagulants, and vitamin supplements. Two weeks later she was presented with chief complaints of fatigue, palpitations, and dizziness diagnosed with Postural Orthostatic Tachycardia Syndrome (POTS) and anxiety disorder. Further, symptomatic management provided with a selective beta-blocker, anti-

arrhythmic drugs, and anxiolytic drugs. The present case report provides a basic insight into complications of POTS and anxiety disorder associated with post-SARS-CoV-2 infection. The appropriate therapeutic treatment and providing better counselling may improve daily activity and quality of life in patients reported with POTS symptoms.

**Key words:** Post SARS-CoV-2 infection, POTS, Anxiety disorder, Psychiatric distress, Cardiac complication, Supportive care.

## Correspondence

**Dr. C Sakthi Thava Priya,**

Department of Pharmacy Practice, Karpagam College of Pharmacy, Coimbatore-32, Tamil Nadu, INDIA.

Email: thavapriya2812@gmail.com

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## INTRODUCTION

In the past twenty years, most different geographical area was highly noted and reported with various widespread infectious outbreaks including Severe Acute Respiratory Syndrome (SARS) (2003), influenza virus with the H1N1 subtype (2009), Middle East Respiratory Syndrome (MERS) (2012), and Ebola virus (2014).<sup>1</sup> The atypical cases with pneumonia was first reported on December 2019, Wuhan, China, which was identified and caused by the new RNA virion and it is grouped as Coronavirus. The new stain of severe acute respiratory syndrome coronavirus 2 (SARS COV-2 ) is considered a contagious deadly virus and had a significant impact on public health.<sup>2</sup> In India the first SARS-CoV-2 case was reported on 30 January 2020 in Kerala.<sup>3</sup> SARS-CoV-2 is a new strain, it is familiar to cause many diseases ranging from cold to severe respiratory illnesses including SARS and Middle East Respiratory Syndrome (MERS).<sup>1</sup> The most common symptoms of the SARS-CoV-2 infection include pyrexia, chills, dry cough, sore throat, myalgia, nausea and vomiting, and also diarrhea.<sup>4</sup> The major difference among the different coronavirus with SARS-CoV-2 is the rapid nature of spread and the virus remains active for a long time in the source or medium of spread.

During and after SARS-CoV-2 exposure many complications were reported which includes psychiatric disorders like post-traumatic stress disorder (PTSD), major depressive disorders, anxiety disorder and obsessive-compulsive disorder (OCD).<sup>5-7</sup> Apart from psychiatric diseases, SARS-COV-2 is also associated with many central nervous system abnormalities like stroke, encephalitis, encephalopathy, anorexia, headache, nausea, and delirium.<sup>6</sup>

There were many pathological mechanisms involved in the pro-inflammatory mediators and SARS-CoV-2 infection which leads to a major contribution in the underlying pathophysiology of cardiac and arrhythmic complications. Several studies have been explained and reported the SARS-CoV-2 associated cardiac and neurological complications.<sup>8</sup> Hence, patients are at even higher risk of cardiac arrhythmias and conversely patients often report postural orthostatic tachycardia syndrome (POTS).<sup>9,10</sup>

## CASE REPORT

### Initial Observation

A 56-year-old female patient was admitted with chief complaints of dry cough, mild dyspnoea, fever (on and off), and itchy throat at the casualty unit of the emergency department. She was a known case of hypertension. She was shifted to the screening ward for SARS-CoV-2 and the throat and nose specimen swab was taken for real-time polymerase chain reaction serology testing and was confirmed with a positive SARS-COV-2 infection. Her lab investigations revealed that elevated lactate dehydrogenase (396U/L), C-reactive protein (CRP=19.9mg/dl), ferritin, and interleukin-6 levels. Her vital parameters manifested as an increase in temperature (100.4°F) with normal oxygen saturation measured by a pulse oximeter. Intravenous methylprednisolone 40 mg and paracetamol one gm were administered as STAT order and she was later shifted to the emergency covid ward.

High resolution computed tomography (HRTC) showed moderate bronchitis with atelectasis and small bulla formation in the left lower

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lobe and the CO-RADS score yielded category 6. Intravenous remdesivir 200 mg was started as loading dose during in-hospital stay and dose was maintained with 100mg for 5 days. Oxygen saturation dropped from 98% to 94% with mild exertion. Supplemental oxygen (2 litres) was given for 5-7 hr to maintain saturation. During the hospital stay, she has developed shortness of breath and fatigue which was managed conservatively. A detailed description of symptoms along with the treatment regimen was given in Table 1. The patient improved symptomatically and discharged with newer oral anticoagulants.

### Post COVID Observation

The patient's signs and symptoms were improved within few days after discharged from the covid care ward. Two weeks later, she was reported and developed fatigue, mild headache, dizziness with palpitations especially while getting up from the sitting position and began to experience these symptoms. She was again tested for SARS-CoV-2 serology assessment and a negative result was obtained. Her electrocardiography showed sinus tachycardia and possible left atrial enlargement with no ischemic changes (Figure 1). She also developed orthostatic light-headedness and presyncope on the next day of admission. There was no abnormality seen in the brain magnetic resonance imaging.

Further continued examination shows that her heart rate was 86 bpm and blood pressure of 120/85 mmHg in sitting position. Her heart rate was 106 bpm and her blood pressure was 105/74 mmHg upon standing position. Due to her complaints of orthostatic condition, it shows increased heart rate, she was examined and underwent head-up tilt-table (HUTT) testing showed POTS within ten minutes of upright tilt.

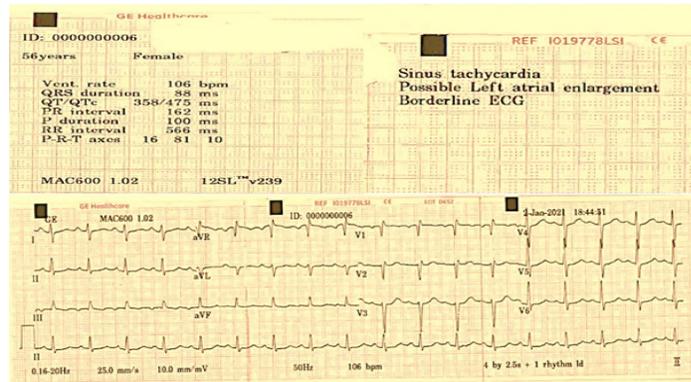


Figure 1: ECG taken after SARS-CoV-2 infection.

Her findings were very much consistent with the diagnosis of POTS and started with T. Ivabradine 5mg. This resulted in symptomatic improvement of her orthostatic symptoms and tachycardia.

After two days she was started and reported to develop mild gastrointestinal disturbances like indigestion, epigastric pain, nocturia along insomnia on the third day of admission which was managed with proton pump inhibitors, antacids, and a low dose of clonazepam 0.5 mg. She was agitated and felt inner restlessness for which baseline inflammatory markers like CRP, neutrophil/lymphocyte ratio (NLR), and monocyte/lymphocyte ratio (MLR) were checked and found to be normal. Using State-Trait Anxiety Inventory Form Y (STAI-Y).<sup>11</sup> score was found to be 43. She was diagnosed to have a moderate anxiety disorder, for which oral alprazolam 0.5mg and escitalopram 5mg were prescribed which improved her anxiety symptoms. The patient was discharged after 5 days from hospital wards, with observed mild improvement in her orthostatic symptoms and anxiety.

### DISCUSSION

SARS-COV-2, besides the lungs also involves other body organs and causes stroke, encephalopathy, encephalitis, anorexia, headache, nausea, and delirium.<sup>6</sup> In post-SARS-CoV-2 patients, changes in the functioning of more than one component of the autonomic nervous system (ANS) affect the health which leads to dysautonomia, thus focuses on the POTS. This condition is distinguished by a sustained increase in heart rate of  $\geq 30$  beats/min within 10 min of standing or head-up tilt. The cardiologic symptoms include orthostatic intolerance, chest pain, palpitations, and exercise intolerance it is similar in our patient.<sup>12</sup>

Several possible pathophysiological mechanisms might be associated with post-SARS-CoV-2 POTS. One possible mechanism is a decrease in blood volume which is due to fever, excessive nocturnal sweating with a secondary increase in cardiac Sympathetic Norepinephrine System (SNS) outflow. Deconditioning with low stroke volume and high SNS or Sympathetic Adrenergic System (SAS) outflow with exercise intolerance and fatigue which is collectively called as Grinch heart have been noticed in POTS. Second, there is an increase in cardiac SNS outflow due to destruction and infection of extracardiac postganglionic SNS neurons by SARS-CoV-2 which leads to venous pooling during orthostasis. The third possible mechanism is increased central sympathetic outflow due to invasion of SARS-CoV-2 in the brainstem and alteration in functions of medullary centers.<sup>12</sup> And the final one is autoimmunity in response to viral infection. If there is any disruption in balance—“Dyshomeostasis”, POTS can occur hence in the presented case.<sup>7,12</sup>

The post-SARS-CoV-2 patients show a high prevalence of emergent psychiatric conditions including mood disorders, anxiety disorders, and insomnia.<sup>11,13</sup> The cause of anxiety in SARS-CoV-2 patients can be one

Table 1: Description of symptoms and treatment given to manage SARS CoV-2.

Days	Symptoms	Management
DAY 1-6	Dry cough, mild dyspnoea, fever (on and off) and itchy throat.	Injection cefoperazone and salbactam 3g b.d Injection Paracetamol 1g b.d Injection Remdesivir 200mg as a loading dose followed by 100 mg daily Injection Methylprednisolone 40mg-b.d Tablet Pantoprazole 40mg-o.d Tablet Amlodipine 2.5mg-o.d Syrup Chlorpheniramine 5ml-tds Nebulizer Duolin every 12 hr Tablet Vitamin C and zinc supplements
DAY-7	D Dimer test was found to be positive (0.62 mg/L)	Loading dose of Enoxaparin 0.4cc followed by Tablet Abixaban 2.5mg –bd was added to regimen
DAY8-10	Shortness of breath with sleep disturbance and decreased oxygen saturation about 94% was noted	Nebulizer Duolin every 8 hr Tablet Alprazolam 0.5mg –HS Supplemental oxygen 2 liters was added.
DAY 11	Significant improvement in the health condition with no fever for >3days and improved respiratory symptoms was observed.	Dis-charge medications: Prednisolone Pulse therapy for 3 weeks-b.d Tablet Abixaban 2.5mg for 4 weeks-o.d Vitamin supplements for 2 weeks Advised to undergo self-quarantine for 2 weeks.

o.d-once a day, b.d-twice a day, tds-thrice a day, HS-at bed time

of the reasons for the high mortality rate, novel and unexplored, and its rapid transmission, also concerns about the future.<sup>14</sup> Many studies have shown that SARS-CoV-2 affects mental health outcomes such as anxiety, depression, and post-traumatic stress symptoms.<sup>15,16</sup> In this condition body's immune system weakens and there is an increase in the risk of contracting the virus when anxiety is above normal.<sup>17</sup>

Due to any social isolation, psychological impact and fatal illness, chances of infecting others also with the immune response to the virus can be the underlying consequences of psychiatric symptoms to SARS-CoV-2 infection. The immune response induces the production of many inflammatory mediators, cytokine and chemokine.<sup>18</sup> Increased concentration of T-helper-2 cell-secreted cytokines and their dysregulation were associated with psychiatric disorders.<sup>19</sup>

The possible relationship found between the immune system and psychopathological mechanism of psychiatric disorders includes dysfunction in the hypothalamic-pituitary-adrenal (HPA) axis, inflammation in the neuron, invasion of the peripheral immune cell into the CNS, impairment in neurotransmission, activation of microglia, disruption in blood-brain-barrier and induction of indoleamine 2,3-dioxygenase (IDO).<sup>17</sup> Mild isometric exercises, repletion of fluid and salt, avoiding exacerbation, and compression garments would help in POTS.<sup>18</sup> Pharmacological treatment includes Fludrocortisone, a fluid expander, were used in hypovolaemia persists patients.

Midodrine, used for the treatment of tachycardia and orthostatic hypotension. Further, hyperadrenergic symptoms were treated with clonidine and methyl dopa.<sup>20</sup> Several months after SARS-CoV-2 infection, many new symptoms and syndromes are emerging. Considering the great impact of SARS-CoV-2 infection on mental health, we would like to suggest early assessment of emergent anxiety conditions of SARS-CoV-2 infection survivors and treat them symptomatically.

## CONCLUSION

The present case report provided insight information on anxiety disorder and postural orthostatic tachycardia syndrome (POTS) which was associated with post-SARS-CoV-2 infection in a female patient. The patient's quality of life was improved with appropriate treatment, counselling, and regular monitoring.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ABBREVIATIONS

**SARS-CoV-2:** Severe acute respiratory syndrome of coronavirus 2 SARS-CoV-2; **POTS:** Postural orthostatic tachycardia syndrome; **MERS:** Middle East Respiratory Syndrome; **PTSD:** Post-traumatic stress disorder; **OCD:** Obsessive-compulsive disorder; **CRP:** C-reactive protein; **STAT:** Latin team "immediately"; **HRTC:** High resolution computed

tomography; **CO-RADS:** Covid -19 reporting and data system; **NLR:** neutrophil/lymphocyte ratio; **MLR:** Monocyte/lymphocyte ratio; **ANS:** Autonomic nervous system; **SNS:** Sympathetic Norepinephrine System; **HPA:** Hypothalamic-pituitary-adrenal.

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