

# COVID-19 and Tinnitus



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## Abstract

Coronavirus disease 2019 (COVID-19) is an infectious respiratory disease caused by the severe acute respiratory syndrome coronavirus 2, brings with it a plethora of health concerns. Although most people have mild symptoms, which are respiratory in nature, some experience neurological symptoms, central nervous system manifestations, peripheral nervous manifestations, and skeletal muscle manifestations. But the damaging impact of COVID-19 virus on the hearing organs in the inner ear is a new finding yet to be explored. Currently, there is little evidence published connecting novel coronavirus and tinnitus directly. But according to the American Tinnitus Association, preexisting behavioral conditions make it more likely for patients to experience tinnitus due to the stress and depression associated with social isolation and infection avoidance. Hearing loss and Tinnitus is a common pathology seen in otolaryngology and there are numerous papers in literature describing its associations with other infections. However, this is the first reported case of hearing loss and tinnitus in a COVID-19 patient, in the State of Qatar, and this case report strives to contribute to the ocean of literature highlighting the need for otorhinolaryngologists to be aware of its correlation with COVID-19 virus.

## Keywords

COVID-19, tinnitus, OAE, SARS-CoV-2

## Introduction

Coronavirus disease 2019 (COVID-19) is an infectious respiratory disease caused by the severe acute respiratory syndrome coronavirus 2, brings with it a plethora of health concerns. While most people have mild symptoms, which are respiratory in nature, some experience neurological symptoms, central nervous system manifestations, peripheral nervous manifestations, and skeletal muscle manifestations.<sup>1</sup> But the damaging impact of COVID-19 virus on the hearing organs in the inner ear is a new finding yet to be explored.<sup>2</sup>

Currently, there is little evidence published connecting novel coronavirus and tinnitus directly. But according to the American Tinnitus Association, preexisting behavioral conditions make it more likely for patients to experience tinnitus due to the stress and depression associated with social isolation and infection avoidance.<sup>3</sup>

Hearing loss and tinnitus is a common pathology seen in otolaryngology, and there are numerous papers in literature describing its associations with other infections. However, this is the first reported case of hearing loss and tinnitus in a COVID-19 patient, in the State of Qatar, and this case report strives to contribute to the ocean of literature highlighting the need for otorhinolaryngologists to be aware of its correlation with COVID-19 virus.

## Case Report

A 35-year-old female patient presented to ENT clinic with ringing sensation and reduced hearing sensitivity in left ear. The patient had a past history of COVID-19, and treatment was done conservatively at home as she had no features of pneumonia. She had experienced hearing loss and tinnitus during COVID, and these symptoms persisted even after recovery from COVID-19. Hence, a detailed audiological evaluation was mandatory.

Pure tone audiogram (PTA) was carried out in MAICO dual channel clinical audiometer with TDH 39 headphones in sound

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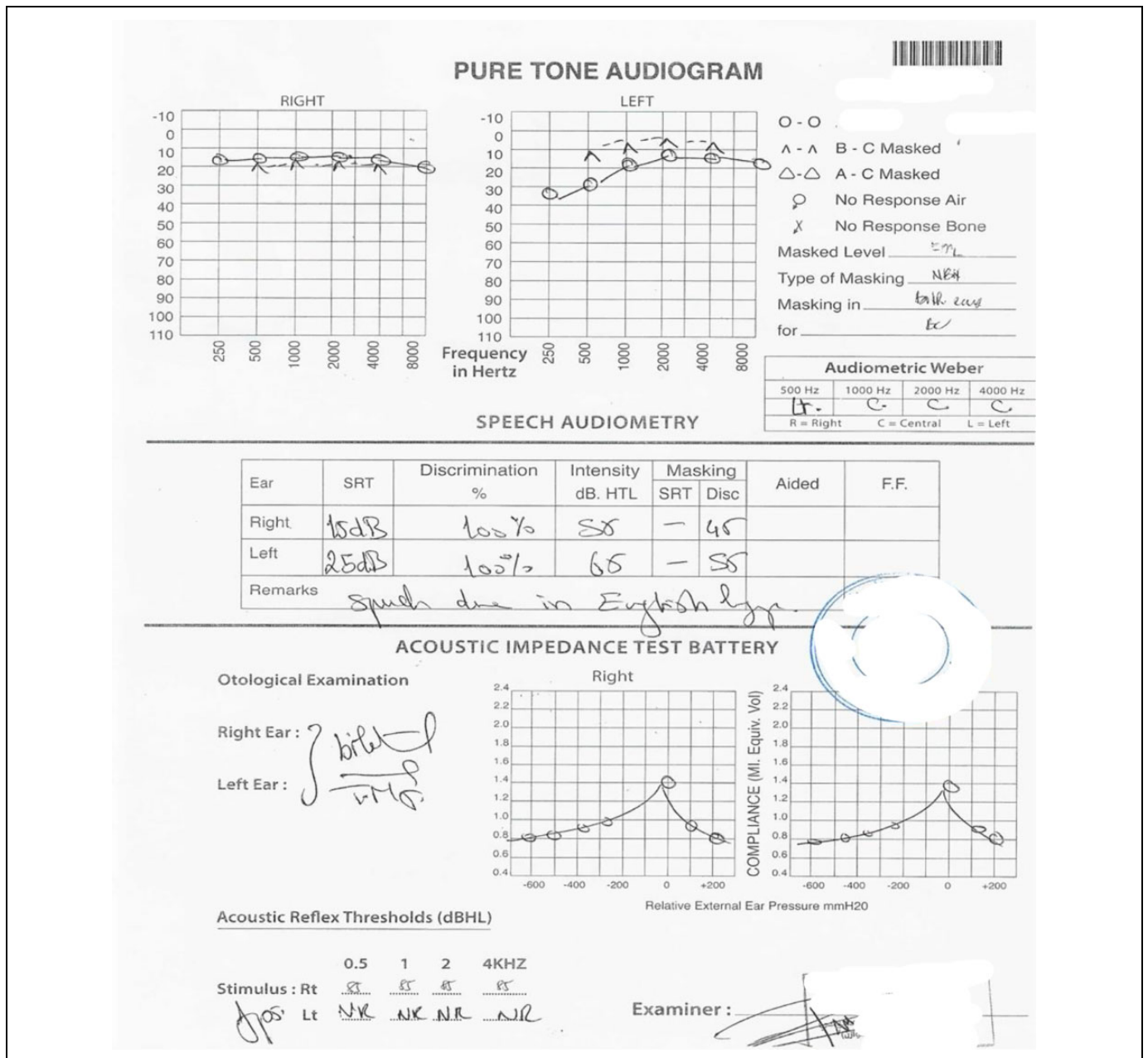


Figure 1. Pure tone audiogram.

booth. Frequencies from 250 Hz to 8 kHz were tested and results revealed normal hearing sensitivity in right ear (PTA average of 500, 1 kHz, 2 kHz were 15 dB) low frequency raising pattern was noticed on the left side (ie, 250 was 30 dB, 500 was 25 dB, 1kHz was 15 dB PTA was 16.6) suggesting mild low-frequency sloping toward normal hearing at high frequencies. Speech recognition score was 100% on both the ears using phonetically balanced and spondee words (Figure 1).

Tuning fork test of weber lateralized toward left ear for 256 Hz tone and not lateralized for 512 and 1024 Hz tone.

Impedance audiometry revealed bilateral A type tympanogram, and reflexes were noticed at 85 dB for all the frequencies

on the right side and reflexes were absent for the left side. Contralateral reflexes could not be done due to instrumental limitation.

Otoacoustic emission was carried out and transient-evoked otoacoustic emissions and distorted product otoacoustic emissions were performed on the individual, and results revealed otoacoustic was passed in both ears for mid and high frequencies (ie, 1 k, 2 k, and 4 k) and absent for low frequencies in left ear suggesting outer hair cell damage.

Tinnitus evaluation was carried out and frequency and intensity matching of tinnitus was done; tinnitus was observed at 4 kHz at 10 dB. MRI head was performed to rule out any central cause and found normal.

## Discussion

The low-frequency pure tone thresholds as well as the TEOAE and DPOAE low-frequency amplitudes were absent. The results of the current study showed that COVID-19 infection had deleterious effects on the outer hair cells in the cochlea. Moreover, the absence of the major symptoms does not guarantee a safe healthy cochlear function. The damage to the outer hair cells was evidenced by the reduced amplitude of the TEOAEs and DPOAEs. Auditory system damage secondary to viral infections is typically intracochlear; however, some viruses can affect the auditory brainstem as well. Mechanisms of injury to the peripheral auditory system can include direct viral damage to the organ of Corti, stria vascularis, or spiral ganglion, damage mediated by the patient's immune system against virally expressed proteins (Cytomegalovirus) and immunocompromise leading to secondary bacterial infection of the ear (human immunodeficiency virus and measles).<sup>4</sup> The results of the present study also demonstrated that the absence of major symptoms may hide unknown impact on the delicate sensory organs taking the cochlea as an example.

Over all summary of audiological testing concluded that patient revealed normal hearing sensitivity in right ear and a low frequency raising pattern in the left ear, suggesting low-frequency sloping toward normal hearing at high frequencies. The low-frequency hearing loss pattern may be attributed due to COVID-19 although further tests and larger sample size are required to confirm the diagnosis.

In conclusion, this case report highlights the importance of detailed audiological diagnostics in COVID-19 patients who experience isolated tinnitus and hearing loss. As with all

pandemics, COVID-19 should be kept under close monitoring, and the otolaryngologist must be kept in mind that COVID-19 can manifest itself with different findings. A detailed history, clinical examination, and audiological assessment are mandatory in evaluation of patients with tinnitus and hearing loss.


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