



## Case Study: A Possible Link between COVID-19 and Hearing Loss

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### Abstract

Abundant research presented that the novel coronavirus identified as COVID-19 distresses the human body in numerous ways and may lead to death. Diminutive is acknowledged about the effects of the virus within the auditory pathway. Many patients reported hearing and tinnitus changes post infection. Majority of these were either self-reported or from medical records.

This case study presents an adult acute otitis media as the main symptom of COVID-19 infection. This sheds new light on the issue and urges for more quality research to help with the early detection of auditory malfunction associated with COVID-19 to provide urgent treatment and a better outcome.

**Keywords:** COVID-19; Hearing Loss; Auditory Pathway

### Introduction

The new variant of corona virus, severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) named: COVID-19, has become an unprecedented global clinical peril, since it's first outbreak in late December 2019. The first incidence was identified in Wuhan-China but swiftly propagated to the whole world causing a global pandemic [1].

Despite time passing since it was first discovered, our knowledge is still limited, and new variations are appearing in different parts of the world. Though COVID-19 proved to manifest itself with different indicators, classical symptoms are high fever, constant cough, and respiratory distress.

Initially, the focus of the pandemic was mostly the severe acute respiratory manifestation. Gradually more intriguing clinical symptoms have unfolded: Firstly gastrointestinal, then cardiovascular and olfactory and gustatory manifestation. The elderly who have been the major target population of COVID-19, are prone to

hearing loss (HL). Consequently, little emphasis has been put on HL as a manifestation for COVID-19.

Most cases admitted to hospitals present with severe health comorbidities that required critical intensive care to save their lives. Most mild/moderate cases that need isolation for 2 weeks were dealt with over the phone with only guidance offered. Consequently, most HL cases have been either unreported or, yet, undiagnosed.

Globally, a literature review [2] found that several studies have reported HL as a direct result of COVID-19 infection. Jeyasakthy [3] documented a UK case of SSNHL following COVID-19. Fidan [4] reported another case where COVID-19 caused acute otitis media.

A myriad of studies evidenced the detrimental effects of permanent HL on the affected people's quality of life. With early intervention HL has been shown to produce more positive outcome.

### Case Study

This case study focuses on a 30-year-old young mother's experience with COVID-19 infection and subsequent conductive HL

(CHL), otalgia and persistent whooshing tinnitus. She reported no comorbid disease. The client is working as a supply teacher for primary school children. As a result, she must be tested with polymerase chain reaction test (PCR) on a weekly basis. Upon receiving a positive result, she was asked to isolate at her home and follow the quarantine protocol for the next 14 days. Consequently, the whole family who live at the same premises, her mother, and her infant daughter, were infected with COVID-19.

She has had no other treatment as she reported no other classical COVID-19 symptoms such as anosmia or ageusia apart from earache. She tried to call her medical practice explaining immense pain in both ears with her Right being “unbearable”. They advised her that it was due to COVID-19. She reported dizziness, loud tinnitus, and balance issues. she was prescribed anti-dizziness medications and pain killers. She later reported a “bang” in her Right ear and bleeding down her Right cheek. Sometime later and after a subsequent PCR test produced a negative result. She started to notice discomfort in her right ear and difficulties hearing both at work and at home.

She was seen at the clinic 51 days after the first PCR results and 21 days after the repeated negative PCR result which was 14 days after infection. Video otoscopy showed Right central tympanic membrane (TM) perforation and a clear meatus. The audiometry resulted with Left normal hearing and Right mild-moderate CHL (Figure 1). She was very distressed with the findings, Thereby the appointment ended abruptly due to her emotional state.

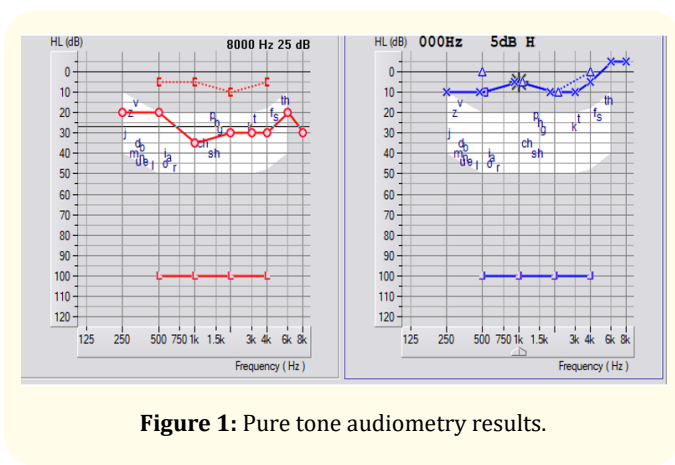


Figure 1: Pure tone audiometry results.

## Discussion

The patient didn’t experience any other COVID-19 symptoms. This may relate to number of infectious particles that she was exposed to at the inoculum point. Studies show that infection severity and prognosis depend on initial viral load [5]. She never reported any hearing difficulties pre COVID-19. Hence, no direct aetiology for the patient CHL and it’s postulated as a direct result of COVID-19.

The conductive pathway of hearing could have been affected when the infection in the upper respiratory tract risen from the patient’s nasopharynx, resulting in fluid building up behind TM and causing acute otitis media leading to the bulging of the TM. The accumulation of infected fluids caused pressure and resulted with rupture of the TM and the fluids escape through ear canal. Few studies reported similar cases post COVID-19 infection: Fidan [4], Karimi., *et al.* [6], Ye [7], Mohan., *et al* [8].

Conversely, COVID-19 manifestation varies from asymptomatic to sever or fatal [9] she might have an asymptomatic case, which coincided with bacterial aetiology otitis media with effusion (AOM). AOM may be caused by bacteria or viruses. *Haemophilus influenzae* is the most common found in bacterial cultures [10]. There was no urgent intervention. Consequently, no bacterial culture was cultivated, to prove the link between the OME and COVID-19 was not circumstantial. But corona virus has been isolated from OME fluid (Pitkäranta., *et al.* 1998).

She reported hearing difficulties at home and at work post COVID-19 infection. A standard battery of tests was conducted on the patient. She had a pure tone audiometry test. But there are no previous results to compare with, to establish a direct link between COVID-19 and her HL. she reported no previous hearing difficulties within her medical history prior to COVID-19. Lamounier., *et al.* [11] provided pre and post COVID-19 Infection audiometric thresholds and showed COVID-19 and sudden onset sensorineural hearing loss (SSNHL) link. There was no speech-in-noise test and tympanometry to reinforce the absence of an effusion as seen by Video-otoscopy. Both tests wouldn’t be accurate due to the fatigue and irritability that persisted post COVID-19 infection.

The patient was referred to ENT to monitor healing of her TM. A subsequent audiologic assessment and counselling session were booked to overcome her emotional distress with the effects of her battle with COVID-19 as well as the possible need for hearing aid intervention to alleviate her communications difficulties.

Historically, patients often report HL following viral infection whether conductive or sensorineural, unilateral, or bilateral. Otolaryngologists frequently encounter SSNHL in their clinics. As well as temporary or permanent CHL. The adverse effects of meningitis, measles and mumps viruses on HL are well documented. Viral-induced HL can range from mild to profound in degree. The unknown nature of the pathophysiology of such disease, often demands an urgent intervention with steroids to improve outcomes. Mustafa [12] using objective measures concluded COVID-19 infection could have deleterious effects on cochlear hair cell functions despite being asymptomatic.

Clinical evidence shows that different viruses can cause different effects on the auditory pathway. Some causing direct damage to the ear structures depending on the quantity of localised viral load. Subsequently, the HL outcome also varies. Some may be reversible using antiviral medications. This presents a better chance to recover from HL and demands an urgent intervention to minimise future incidents.

## Conclusion

Many studies have investigated the link between COVID-19 and HL [13]. Until now COVID-19 has not been regarded as a precursor of HL. A systematic review concluded that there were multiple reports of audio-vestibular symptoms associated with COVID-19 [2]. This case study highlights the urgency of a training system for primary health professionals to support COVID-19 patients, reporting audio-vestibular symptoms and allow rapid access to ENT services. This highlights the critical need for new studies that deliver insights into the function and reaction of the audio-vestibular system to COVID-19 infection and the consequences of that infection [14].

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