

## **Bilateral Sudden Sensorineural Hearing Loss Post-COVID-19 “A Case Report”**

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### **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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**Case Study**

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### **ABSTRACT**

**Background:** Sudden sensorineural hearing loss (SSNHL) is an otolaryngological emergency that requires early diagnosis and management. In most cases, the cause is unknown; however, viral infection is the most likely causative factor. The early start of steroids is a cornerstone of treatment and good prognosis. Despite the extensive study about the presentations of COVID-19, there are few case reports about hearing loss after coronavirus infection.

**Case Presentation:** This case report presents the first case of SSNHL following COVID-19 in Saudi Arabia for which other causes of hearing loss were excluded by physical examination and imaging. Course of steroid given to the patient without improvement in the hearing.

**Conclusions:** It is important to pay more attention to hearing status following COVID-19. This will result in early diagnosis, management and improved prognosis.

*Keywords: Sudden sensorineural hearing loss (SSNHL); hearing loss; COVID-19; Case report.*

## ABBREVIATIONS

*SSNHL: Sudden sensorineural hearing loss*

*TEOAE: Transient evoked otoacoustic emissions*

*SARS-CoV-2: The novel coronavirus*

## 1. INTRODUCTION

### 1.1 Background

Sudden sensorineural hearing loss (SSNHL) is defined as sensorineural hearing loss of at least 30 dB in at least three consecutive frequencies that develops within 72 hours [1]. In most SSNHL cases, the cause is unknown and idiopathic; however, it is caused by several pathologies, including viral causes, vascular occlusion, cellular stress response, and immune mediation. [2]. A number of viruses can cause hearing loss, including the cytomegalovirus, measles, and herpes species. Viral infections result in SSNHL through direct inner ear structures damage or indirectly by inducing inflammatory responses that cause damage to these structures [3].

In Wuhan, China, the novel coronavirus (SARS-CoV-2) emerged, causing the COVID-19 pandemic [4]. The World Health Organization (WHO) announced the outbreak as a Public Health Emergency of International Concern on January 30, 2020 and declared it a pandemic on March 11, 2020 [5]. The COVID-19 is presented by variable symptoms, starting from asymptomatic illness to mild or severe illness and death. Common symptoms include sore throat, fever, malaise, fatigue, cough, shortness of breath, and respiratory distress. Neurological manifestations such as loss of smell and/or taste have been documented in a significant number of reported cases [6]. However, sensorineural hearing loss as a presentation of COVID-19 has not yet been explored. This case reports the first case of SSNHL due to COVID-19 in Saudi Arabia.

## 2. CASE PRESENTATION

A 55-year-old female with a history of diabetes mellitus and hypertension for which she was on medications, presented to the department emergency with fever, cough, and shortness of breath. She was isolated and a nasopharyngeal swab for SARS-CoV-2 was taken before she was admitted to the isolation ward. The polymerase chain reaction (PCR) result was positive for SARS-CoV-2.

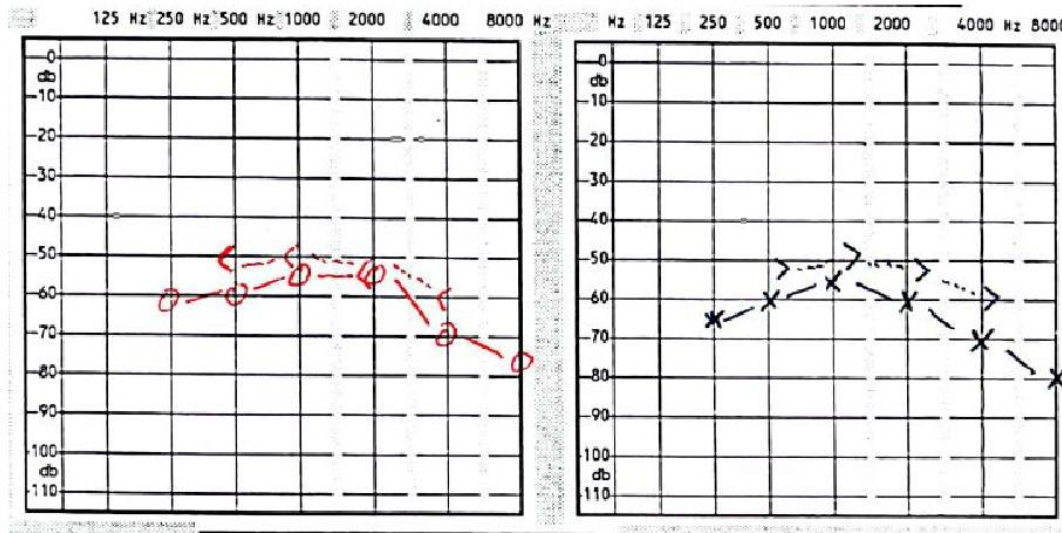
On the third day after hospital admission, she was referred to the ENT specialty because she complained of a sudden onset of bilateral hearing loss and tinnitus. She denied any other ear symptoms such as discharge, pain, dizziness, or vertigo. She had no history of ototoxic medications or head trauma. Previously, she did not have any ear symptoms including hearing loss.

Before admission, the patient's medical history included well controlled diabetes mellitus and hypertension, and her medications included glimepiride (3 mg once daily), vildagliptin/metformin (50 mg/1000 mg once daily), perindopril (5 mg once daily), and atorvastatin (20 mg once daily). During her admission, she received imipenem-cilastatin (1 g three times daily), moxifloxacin (400 mg once daily), favipiravir (800 mg twice daily), zinc sulfate (60 mg daily), omeprazole (20 mg once daily), enoxaparin (40 mg once daily), and regular insulin (100 units four times daily). However, no ototoxic medications were given.

Ear examination revealed bilaterally normal external ear canals and tympanic membranes. Tuning fork tests revealed bilateral positive Rinne's test, while Weber's test was centralized. There was no other additional focal neurological deficit. Audiometry was done and revealed severe bilateral sensorineural hearing loss, while the thresholds were 50, 55, 55, 70 dB at 500, 1000, 2000, 4000 Hz frequencies, respectively (Fig. 1). The impedance tympanometry showed a normal (type A) result bilaterally.

A complete blood count was done and showed normal results; however, CPR and ESR were slightly elevated. Other autoimmune screenings were performed and were negative. Contrasted MRI of the brain and the internal auditory canal revealed normal findings and no lesions were seen at the internal auditory canal or cerebellopontine angles.

A tapering dose of oral prednisolone was given over two weeks, starting at 60 mg daily. After completion of the course, steroid treatment resulted in partial subjective improvement in her hearing. The patient refused any intratympanic steroid administration. One month later, the patient came with no improvement in hearing and her pure tone audiogram showed partial improvement with threshold of 50, 55, 55, 65 dB at 500, 1000, 2000, 4000 Hz frequencies respectively. At that time, we decided to start hearing aid fitting.



**Fig. 1. Bilateral sensorineural hearing loss**

### 3. DISCUSSION

SSNHL is an otolaryngology emergency and should be diagnosed and managed early. The main management options include the use of either oral or intratympanic steroids, or a combination [7]. SSNHL is still a hot topic for research in the otolaryngology field. However, the relationship between SSNHL and COVID-19 has not been explored to date.

A Sriwijitalai and Wiwanitkit report the first case of sensorineural hearing loss in a COVID-19 positive patient in Thailand in April 2020 [8]. Four case reports of sensorineural hearing loss related to COVID-19 have been reported since. In addition, two studies described the new onset of sensorineural hearing loss in patients with positive SARS-CoV-2; they did not have any previous hearing problems and no specific cause was elaborated [9,10]. Degen et al. [11] reported a 60-year-old male with severe pneumonia due to COVID-19 requiring intensive care unit admission who developed bilateral tinnitus and hearing loss and was managed by intratympanic steroids injection and a cochlear implant. Rhman et al. reported a 52-year-old male who presented to the otolaryngology clinic with sensorineural hearing loss. Although otherwise asymptomatic, a nasopharyngeal swab was positive for a SARS-CoV-2. The hearing loss was managed with a course of intratympanic steroid injections, which resulted in partial improvement [12]. Foteini et al. reported a case of previously well

male patient with COVID-19 requiring intensive care unit admission who developed hearing loss and received oral steroids and intratympanic steroid injections which result in partial improvement [13]. In the case reported here, the patient was well and had no risk factors for SSNHL. She received a full course of oral steroids, leading to partial improvement. However, the patient refused the intratympanic steroid.

Kilic et al. [10] investigated the relationship between sensorineural hearing loss and COVID-19. They performed a PCR test on five patients who presented with SSNHL during the COVID-19 pandemic and had no additional symptoms other than SSNHL. One patient of the five was found to be positive for SARS-CoV-2. However, the sensitivity of SARS-CoV-2 PCR testing varies depending on the quality and site of the sample, viral multiplication and clearance, and stage of disease [14]. This makes it possible that the other four patients could have been false negatives.

Mostafa compared the transient evoked otoacoustic emissions (TEOAE) amplitude and pure tone audiometry thresholds between 20 asymptomatic COVID-19 PCR-positive patients and 20 normal control subjects, and found that TEOAE amplitudes and high frequency pure tone audiometry thresholds in COVID-19 PCR-positive patients were significantly decreased [9]. This indicates that COVID-19 infection could result in cochlear hair cell damage.

A limited number of studies point out the relationship between the SSNHL and COVID-19; however, the relationship is valuable to consider. In the case of SSNHL, histopathological studies reveal the loss of both hair and supporting cells in the organ of Corti without infiltration of inflammatory cells, indicating that the pathology of idiopathic SSNHL due to cellular stress pathways [15]. In pathogenesis, SARS-CoV-2 binds to the ACE-2 receptor, which is found in alveolar epithelial and endothelial cells. In mice, this receptor also expressed in epithelial cells of the middle ear, the spiral ganglion and stria vascularis [16]. In addition, SARS-CoV-2 results in an inflammatory response and an elevation in cytokines such as interleukin 1, interleukin 6, and tumor necrosis factor  $\alpha$  [17]. Both mechanisms, directly and indirectly by inflammatory response, can result in sensorineural hearing loss, and this may be the result of SARS-CoV-2 infection.

#### 4. CONCLUSIONS

This case report presents the the first reported case of sensorineural hearing loss following COVID-19 infection in Saudi Arabia. As the pandemic continues, patients presenting with SSNHL should be screened for SARS-CoV-2. In the other hand, patients with a positive SARS-CoV-2, hearing status should be evaluated, especially for those in isolation or the intensive care unit. Further study is needed to understand the association between coronavirus and otological complications so that early diagnosis and management can be achieved.

#### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

#### CONSENT

An informed written consent was taken from the case participant.

#### COMPETING INTERESTS

Author has declared that no competing interests exist.

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