

CASE REPORT**Sudden Sensorineural Hearing Loss in a post COVID-19 patient**Santoshi Pokharel*¹ | Sumita Tamang¹ | Shankar Pokharel² | Rajeev Kumar Mahaseth³

¹College of Medicine, Nepalese Army
Institute of Health Sciences,
Kathmandu, Nepal

²HAMS Hospital, Kathmandu, Nepal

³Department of Otorhinolaryngology, Shree
Birendra Hospital, Kathmandu, Nepal

Correspondence

*Santoshi Pokharel, College of Medicine,
Nepalese Army Institute of Health Sciences,
Kathmandu, Nepal. Email:
santoshi.pokharel@naihs.edu.np

Abstract

We recommend carrying out a detailed history and evaluation for recent or past COVID-19 infection in patients presenting with Sudden Sensorineural Hearing Loss (SSNHL) since SSNHL could be a sequelae of COVID-19 as in our case and timely diagnosis and intervention could significantly improve hearing and quality of life.

KEYWORDS

COVID-19, Corona Virus, Sudden Sensorineural Hearing Loss(SSNHL), SARS-CoV-2 RT-PCR

Key Clinical Message

A detailed history and evaluation for recent or past COVID-19 infection should be done in patients presenting with Sudden Sensorineural Hearing Loss (SSNHL).

1 | INTRODUCTION

SSNHL is defined as sensorineural hearing loss of 30dB or greater over at least three contiguous audiometric frequencies occurring within a 72-hr period¹, usually accompanied by tinnitus or temporary spells of vertigo. It has an annual incidence of about 11-77/1,00,000 cases in US² and mostly occurs in 65 years and older age group with a male predominance of 1.07:1. Hearing loss can be complete or partial but mostly unilateral. Despite being a commonly encountered phenomenon, most often the exact cause of SSNHL remains obscure, and is termed as idiopathic in origin. However other causes that may possibly lead to deafness can be infectious, autoimmune, traumatic (head injury, ear operation), otologic (Meniere's disease), malignancies (acoustic neuroma, schwannoma), vascular (thrombotic, embolic) in origin. Most often viral illness (Cytomegalovirus (CMV), Herpes) leads to hearing loss with no definite mechanism. Since Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a viral infection, a few cases around the globe have been reported correlating SSNHL with COVID-19 infection. So SSNHL can be a sequelae of post COVID-19 infection, provided that other etiologies have been ruled out in a previously normal healthy hearing person.

2 | CASE PRESENTATION

We present a case of a 27-year-old Nepalese male, apparently healthy with no known comorbidities or any ear pathology. He initially had malaise and fatigue for 3-4 days. Later he developed loss of smell and taste sensation for which he was suggested RT-PCR test for SARS-CoV-2 and was tested positive. His vital parameters and saturation were normal at room air so he was advised for home isolation. His home isolation period was uneventful except for mild symptoms. After 1 month, all symptoms resolved but he developed a ringing sensation followed by acute onset of complete hearing loss in the left ear. He made a visit to a nearby hospital on the same day and a follow up visit to the same hospital after three days, audiometric investigations were done at each visit and oral steroids were prescribed. He then had three subsequent visits to our hospital where workup for hearing loss was done along with continuing oral steroids. Physical examination detected no structural abnormality. Oscopic examination

revealed normal external auditory canal. General screening test was done by whispering test which showed decreased response from the affected left ear. Tuning fork test with 512Hz showed positive Rinne’s test on both ears and Weber test was lateralised to unaffected ear. Pure Tone Audiometry(PTA) was done which showed moderately severe SSNHL on the left side (Figure 1 (a)) with normal hearing limit on the right side. Repeat PTA tests were done on day 7 and day 14 after the administration of oral steroid which showed the significant improvement in hearing as shown in (b) and (c) respectively of Figure 1 . There was no evidence supporting other causes for left sided SSNHL as there was no history of ear discharge, trauma, use of ototoxic drugs during his isolation period and no exposure to loud noise. The MRI of brain showed normal scan (Figure 2). Patient was managed by oral steroids on tapering dose. With timely use of the steroids, his hearing improved significantly.

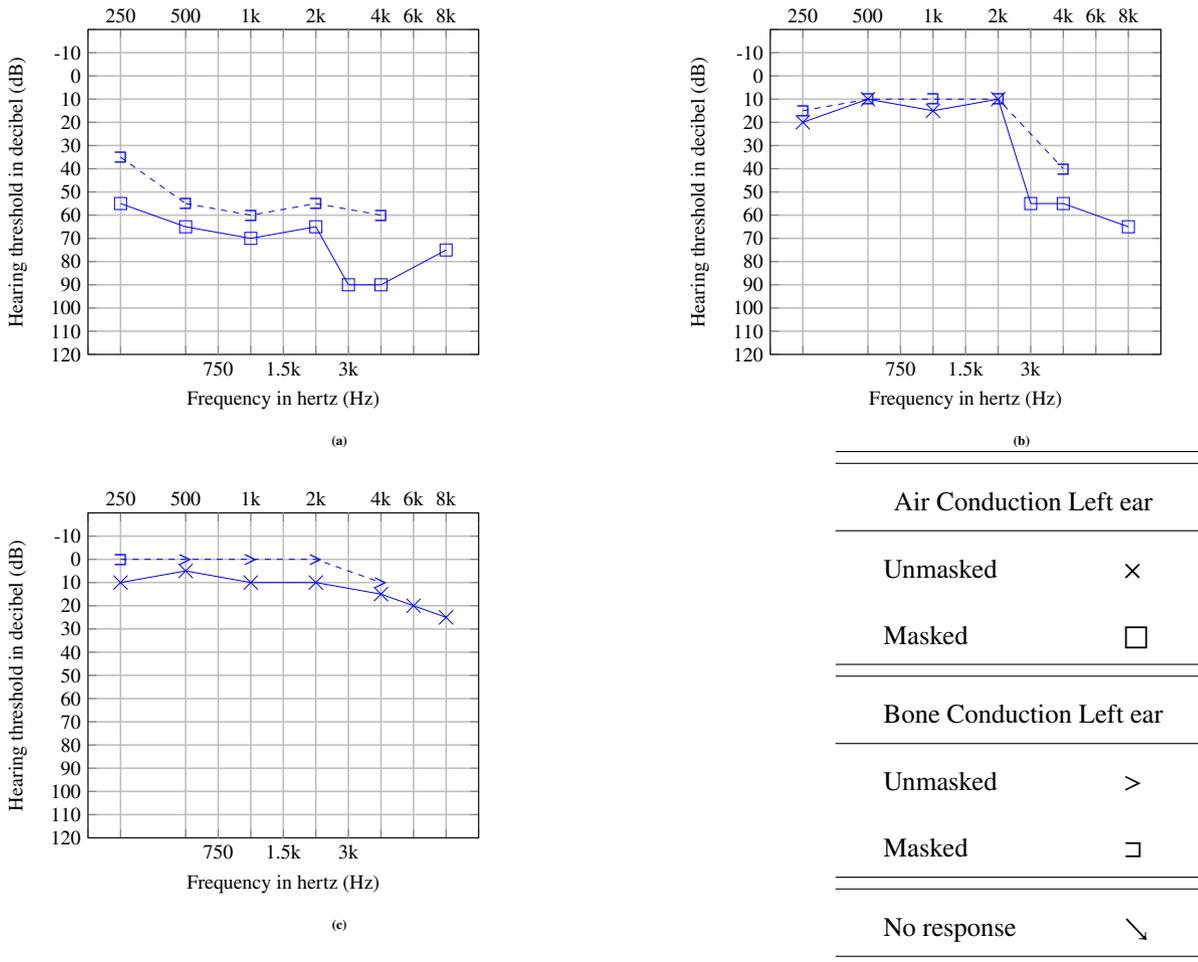


FIGURE 1 PTA (a) at the time of presentation (b) after initiation of oral steroid (c) at completion of oral steroid.

3 | MANAGEMENT

The main treatment the patient received for his symptoms was the administration of oral steroids in tapering dose which resulted in significant improvement in his hearing as seen in PTA (Figure 1). No clear etiology for his SSNHL was established from history, examination and investigations, but a timely hospital visit and timely administration of medication improved his hearing significantly.

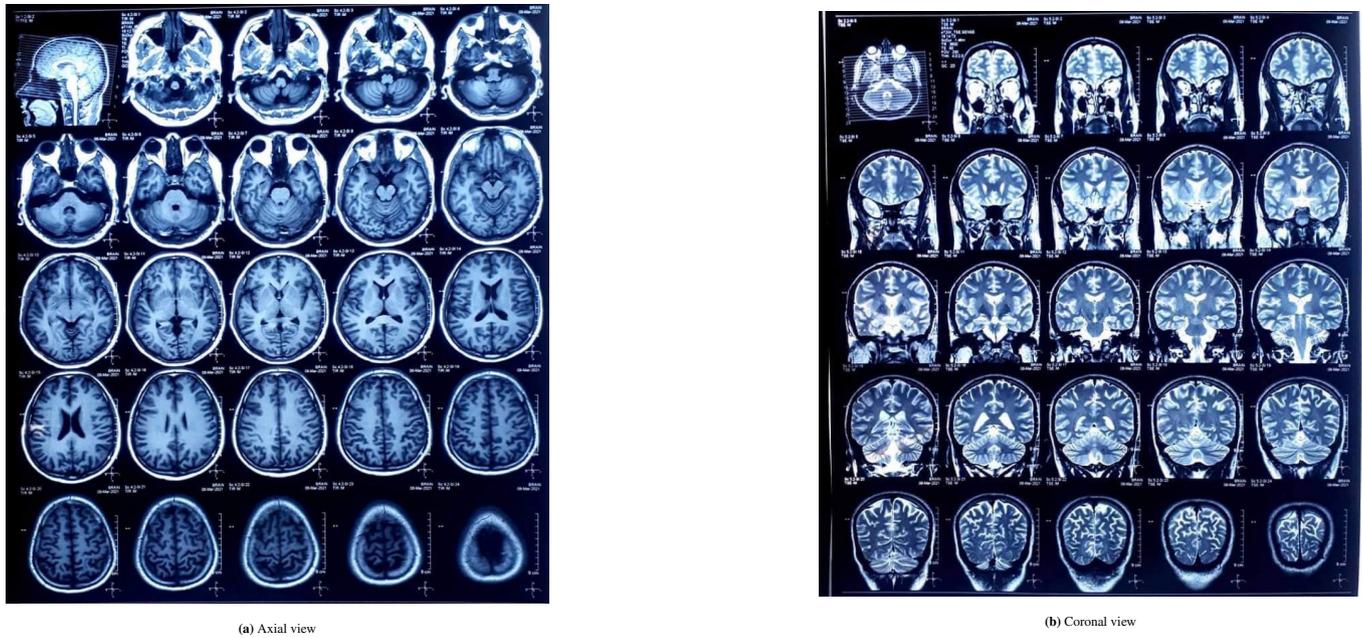


FIGURE 2 The MRI scan of brain

4 | DISCUSSION

COVID-19 is an infection caused by SARS-CoV-2. The clinical spectrum of COVID-19 disease ranges from mild flu-like symptoms to severe critical illness leading to hospitalization causing significant morbidity and mortality. Otorhinolaryngeal symptoms are manifested as anosmia, ageusia, nasal congestion and recently reported symptoms are tinnitus, vertigo and SSNHL³. Hearing loss is usually seen during an active infection but has been reported after three months of infection¹⁶. It has become a matter of discussion and research whether COVID-19 is a causes of hearing loss.

The first case of hearing loss in a COVID-19 positive patient was reported on an old female, on 15th march, 2020 from Thailand⁵. However a detailed observation was not done on the change of hearing loss pattern. A 52-year-old male presented with tinnitus and sudden onset of left sided hearing loss with no other reports suspecting other causes except for SARS-CoV-2 PCR report was managed with intratympanic steroids which improved his hearing⁶. Hearing loss and tinnitus were the symptoms seen in patients with both COVID-19 and Influenza virus but have not been highlighted⁷. In comparative study comprising of 25 COVID-19 positive patients as a test group and non infected patients as a control group, the amplitude of Transient evoked otoacoustic emission (TEOAEs) and threshold for PTA were significantly worse in the test group as compared to control group, concluding COVID-19 infection could have deleterious effects on cochlear hair cells function despite being asymptomatic⁴. SARS-CoV-2 PCR test done in 5 male patients (29-54 years age group) visiting the otolaryngology department outpatient clinic with a sole complaint of unilateral SSNHL showed that 1 out of 5 patients tested positive, suggesting SARS-CoV-2 PCR test in patient presenting with SSNHL⁸. A 60-year-old male, cared in ICU for COVID-19 pneumonia, with no previous complains of hearing problem, developed complete deafness on right ear and profound SNHL on left side with MRI findings suggesting the signs of inflammatory process in cochlea, which could have been virus triggered, immune mediated inflammation in cochlea⁹. A 53-year-old Turkish male with SARS-CoV-2 infection, reported complete unilateral SSNHL following COVID-19 infection¹⁰ and was managed with steroids but the problem persisted after 1 month of steroid treatment. SARS-CoV-2 is believed to bind to ACE receptors¹¹, which is present on alveolar epithelial cells and endothelial cells, similar ACE receptors are found to be present in epithelial cells of middle ear as well as stria vascularis and spiral ganglion of mice¹¹. Apart from this, SARS-CoV-2 causes an inflammatory response and causes increase in cytokines such as IL-1, IL-6, TNF alpha¹² which causes a direct entry into cochlea and causes inflammation leading to cellular stress response causing SNHL and it could be occurring in case of SARS-CoV-2 infection. Coagulopathic disorder with thrombotic events is seen in COVID-19 patients which can lead to SSNHL¹³. Furthermore, histological reports of patients with SSNHL have shown the loss of hair cells and supporting cells of Organ of Corti without inflammatory infiltrate, suggesting the pathology of idiopathic SSNHL¹⁴. Mastoid specimens tested

RT-PCR positive for SARS-CoV-2 in a post mortem bilateral cortical mastoidectomy performed in a post COVID-19 patient,¹⁵ suggesting the presence of virus in middle ear and mastoid. Tinnitus and hearing loss is reported after 3 months of COVID-19 infection in a 49-year-old diabetic male who complained of only mild symptoms during his infectious period¹⁶. Acute onset hearing loss is mentioned in a young patient of COVID-19 who had no prior history of otologic problems along with no use of ototoxic drugs¹⁷. Neurotropic and neuroinvasive property not found in MERS and SARS has been found in the Corona Virus that may lead to SSNHL^{18,19}.

The case which we are talking about is one of the earliest cases of SSNHL post COVID-19 from Nepal. The clinical presentation, denying the use of ototoxic medications, exposure to loud noise or trauma, previous ear problems, along with audiological findings and the MRI of brain showing the normal cross sectional examination report, shares a similar history with the cases reported worldwide, suggesting hearing impairment post COVID-19 infection.

5 | CONCLUSION

The cases of SSNHL in post COVID-19 patient are being reported from different parts of the world. A detailed history and evaluation for recent or past COVID-19 infection should be carried out in any patient presenting with SSNHL as early identification and management of these cases could bring improvement in hearing and quality of life.

6 | ACKNOWLEDGEMENT

Authors are grateful to Priyansha Silwal for her guidance and proofreading the manuscript and Hemanta Kunwar for editing and proofreading the manuscript.

7 | AUTHOR CONTRIBUTIONS

Santoshi Pokharel wrote the manuscript and contributed in conceptualizing, writing and reviewing. Sumita Tamang and Shankar Pokharel contributed in data collection, writing and reviewing. Rajeev Kumar Mahaseth contributed in reviewing and supervision.

8 | CONFLICT OF INTEREST

None declared.

9 | FINANCIAL SUPPORT AND SPONSORSHIP

None.

10 | ETHICAL APPROVAL

This case was written and published with the consent of the patient.

References

1. Kuhn M, Heman-Ackah SE, Shaikh JA, Roehm PC. Sudden sensorineural hearing loss: a review of diagnosis, treatment, and prognosis. *Trends Amplif.* 2011;15(3):91-105.

2. Alexander TH, Harris JP. Incidence of sudden sensorineural hearing loss. *Otol Neurotol*. 2013 Dec;34(9):1586-9.
3. Elibol E. Otolaryngological symptoms in COVID-19. *Eur Arch Otorhinolaryngol*. 2021;278(4):1233-1236.
4. Mustafa MWM . Audiological profile of asymptomatic Covid-19 PCR-positive cases. *Am J otolaryngol* 2020;41:102483.
5. Sriwijitalai W , Wiwanitkit V . Hearing loss and COVID-19: a note. *Am J Otolaryngol* 2020;41:102473.
6. Rhman SA , Wahid AA . COVID-19 and sudden sensorineural hearing loss: a case report. *Otolaryngol Case Reports* 2020;16:100198.
7. Zayet S, Kadiane-Oussou NJ, Lepiller Q, et al. Clinical features of COVID-19 and influenza: a comparative study on Nord Franche-Comte cluster. *Microbes Infect*. 2020;22(9):481-488.
8. Kilic O, Kalcioğlu MT, Cag Y, et al. . Could sudden sensorineural hearing loss be the sole manifestation of COVID-19? An investigation into SARS-COV-2 in the etiology of sudden sensorineural hearing loss. *Int J Infect Dis* 2020;97:208–11.
9. Degen C, Lenarz T , Willenborg K . Acute profound sensorineural hearing loss after COVID-19 pneumonia. *Mayo Clin Proc* 2020;95:1801–3.
10. Beckers E, Chouvel P, Cassetto V, Mustin V. Sudden sensorineural hearing loss in COVID- 19: A case report and literature review. *Clin Case Rep*. 2021;9:2300–2304.
11. Uranaka T, Kashio A, Ueha R, et al. . Expression of ACE2, TMPRSS2, and furin in mouse ear tissue. bioRxiv 2020.
12. Vallamkondu J, John A , Wani WY , et al . SARS-CoV-2 pathophysiology and assessment of coronaviruses in CNS diseases with a focus on therapeutic targets. *Biochim Biophys Acta Mol Basis Dis* 2020;1866:165889.
13. Görlinger K, Dirkmann D, Gandhi A, et al. COVID-19-associated coagulopathy and inflammatory response: what do we know already and what are the knowledge gaps? *Anesth Analg*. 2020; 131(5): 1324-1333.
14. Merchant SN ,Adams JC , Nadol JB . Pathology and pathophysiology of idiopathic sudden sensorineural hearing loss. *Otol Neurotol* 2005;26:151–60.
15. Frazier KM, Hooper JE, Mostafa HH, Stewart CM. SARS-CoV-2 Virus Isolated From the Mastoid and Middle Ear: Implications for COVID-19 Precautions During Ear Surgery. *JAMA Otolaryngol Head Neck Surg*. 2020;146(10):964–966.
16. Chakraborty S, Maharatna S, Reddy CS, Gupta G, Baitha U, Jorwal P, et al. Hearing loss in a post COVID-19 patient. *Int J Otorhinolaryngol Head Neck Surg* 2021;7:548-50.
17. Karimi-Galougahi M, Naeini AS, Raad N, Mikaniki N, Ghorbani J. Vertigo and hearing loss during the COVID-19 pandemic - is there an association?. *Acta Otorhinolaryngol Ital*. 2020;40(6):463-465.
18. Li YC, Bai WZ, Hashikawa T. The neuroinvasive potential of SARS-CoV2 may play a role in the respiratory failure of COVID-19 patients. *J Med Virol*. 2020;92(6):552-555.
19. Netland J, Meyerholz DK, Moore S, Cassell M, Perlman S. Severe acute respiratory syndrome coronavirus infection causes neuronal death in the absence of encephalitis in mice transgenic for human ACE2. *J Virol*. 2008;82(15):7264-7275.