



WWJMRD 2025; 11(04): 67-71

www.wwjmr.com

International Journal

Peer Reviewed Journal

Refereed Journal

Indexed Journal

Impact Factor SJIF 2017:

5.182 2018: 5.51, (ISI) 2020-

2021: 1.361

E-ISSN: 2454-6615

Pankaj Kumar

Department of

Otorhinolaryngology, Dr Baba
Saheb Ambedkar Medical
College and Hospital, Delhi,
India.

Manisha Yadav

MBBS, MS

Otorhinolaryngology

Department of

Otorhinolaryngology, Dr Baba
Saheb Ambedkar Medical
College and Hospital, Delhi,
India.

Ajay Kumar Gupta

MBBS, MS

Otorhinolaryngology

Department of

Otorhinolaryngology, Dr Baba
Saheb Ambedkar Medical
College and Hospital, Delhi,
India.

Sarthak Sachdeva

MBBS, MS

Otorhinolaryngology

Department of

Otorhinolaryngology,
University College of Medical
Sciences and GTB Hospital,
Delhi, India.

Pallika Kumar

MBBS, MS

Otorhinolaryngology

Department of

Otorhinolaryngology, Ram
Manohar Lohia Hospital,
Delhi, India.

Correspondence:

Manisha Yadav

MBBS, MS

Otorhinolaryngology

Department of

Otorhinolaryngology, Dr Baba
Saheb Ambedkar Medical
College and Hospital, Delhi,
India.

Analysis of Hearing Loss and Tinnitus in Covid Recovered Patients

Pankaj Kumar, Manisha Yadav, Ajay Kumar Gupta, Sarthak Sachdeva, Pallika Kumar

Abstract

Of the various organ systems in the human body affected by SARS-CoV2 infection, hearing loss is one potentially neglected symptom. Although, a lot of case reports that have been published till date demonstrating sensorineural hearing loss and tinnitus after SARS-CoV2 infection all over the world, there has been a paucity of case studies and systemic reviews on the same. This article is a novel case study done on hearing loss and tinnitus post Covid 19 infection as well as a systematic review of all previous case reports that have been published till date on the same. A total of 15 patients who had recovered from a recent SARS-CoV2 illness and reported a normal hearing before getting the infection were taken for our study. Audiological report of 80% of patients confirmed the sensorineural hearing loss in all the patients to some extent. Out of which 26.6% patients had slight hearing loss, 43.3% mild, 6.6% moderate and 3.3% had severe hearing loss. Although the conventional treatment for such patients has been the use of oral or intratympanic corticosteroids, we preferred not to use the same for our patients due to the risk of developing post-covid mucormycosis and treated them with multivitamin tablets or injections. We found that a significant improvement in hearing was present on a follow-up period of one month. ($p=0.003$) From our study as well as from the review of previously published studies, we have come to a conclusion that SARS-CoV2 infection is a probable cause of hearing loss and tinnitus and patients should seek prompt medical treatment to avoid chances of development of permanent hearing loss.

Keywords: Covid, Sensorineural hearing loss, Tinnitus.

Introduction

Since the time, Covid-19 was declared as a pandemic by WHO, there have been numerous studies on the effect of SARS-CoV2 infection on various organs in human body.¹ Hearing loss has recently been reported by Mustafa et al as a potentially neglected symptom in Covid-19. In his study, he noted a difference on pure tone threshold at high frequency and amplitude of transient evoked otoacoustic emissions between asymptomatic COVID-19 patients and controls. He hypothesised that Sars-CoV2 may have deleterious effects on cochlear hair cell functions.² We noticed a sudden surge in the number of patients with sudden hearing loss almost 1 month post Covid19 infection. We took 15 such patients so as to classify them on the basis of severity and followed up these patients so as to demonstrate the effects of treatment in such patients. These patients were meticulously examined and investigated to rule out all causes of SNHL other than SARS-CoV2 infection.

There have been a lot of case reports that have been published till date demonstrating sensorineural hearing loss after SARS-CoV2 infection all over the world. For example, Beckers et al³ reported a 53-year-old Turkish male patient who developed complete unilateral SSNHL (sudden sensorineural hearing loss) after COVID-19 infection and was managed with steroids, A case report from India by Chakraborty et al⁴ mentioned a 49-year-old diabetic male patient with hearing loss after 3 months of COVID-19 infection, Karimi-Galougahi et al⁵ demonstrated acute-onset hearing loss in a young Covid-19 patient who denied prior otologic problems and use of ototoxic medications. This article is a novel case study done on hearing loss post Covid 19 infection as well as a systematic review of all previous case reports that have been published till date on the same.

This article also focuses on another very troublesome inner ear complication post Covid19 infection which is tinnitus. As there is no standardized criterion for tinnitus, great variability has been found regarding tinnitus severity and characteristics in various studies till date. Viola et al⁶ presented tinnitus descriptions for 43 patients where 17 (39.5%) described tinnitus as recurrent, 10 (23.3%) as occasional, 7 (16.3%) as continuous fluctuating with intensity changes throughout the day, 4 (9.3%) as persistent, 3 (7.0%) as pulsatile, and 2 (4.6%) as continuous (affecting sleep patterns). Due to the sudden and rapid developments of COVID-19, most studies were retrospective or observational cross-sectional studies as large scaled studies could not be conducted due to time constraints and impact of the pandemic on people. Hence longer-term trajectories of the tinnitus presentations could not be identified.

Materials and Methods

A total of 15 patients who had recovered from a recent SARS-CoV2 illness in the 2nd wave in India presented to our OPD with complaints of sudden hearing loss and ringing sensation in one or both ears. All these patients had active SARS-CoV2 infection more than one month ago and were negative on 2 consecutive RT-PCR tests now and had completed at least 15 days of home isolation. All the patients reported a normal hearing before getting the SARS-CoV2 infection. A detailed history was taken from all these patients to rule out other causes of SNHL like ear discharge, trauma, ototoxic drug intake in isolation period and exposure to loud noise. On otoscopic examination all the patients had intact tympanic membrane. All patients

underwent pure tone audiometry. MRI brain were done in all patients to rule out retrocochlear pathology of hearing loss like acoustic neuroma, meningioma etc.

Although the conventional treatment for such patients has been the use of oral or intratympanic corticosteroids, we preferred not to use the same for our patients and treated them with multivitamin tablets or injections. The reason for not using steroids in our patients was the rapid increase in cases of post-covid mucormycosis which became an endemic in our country due to excessive steroid use in treatment of Covid patients. We followed up our patients at 1 and 3 months after giving medications so as to note the response to treatment in these patients.

Results

Out of the 15 patients included in our study, 9 (60%) were male and 6 (40%) were female. Maximum patients who presented with SSNHL fell in the age group between 30 to 60 years (80.1%) while 3 patients (19.9%) were in the extremes of ages (less than 30 and more than 60 years). A total of 60% patients had involvement of both ears while 40% had involvement of only one ear. Both sides were affected equally. The average time of presentation of hearing loss after SARS-CoV2 infection was 2.26 months. While most patients presented as early as 1 month post covid, very few presented as late as 8 months post-covid. Audiological report of the patients confirmed the sensorineural hearing loss in all the patients to some extent. We classified the patients according to bone conduction thresholds as slight (16-25 db), mild (26-40 db), moderate (41-55 db), moderately severe (56-70 db) and severe (71-90). (Table 1)

S. No.	Degree of Hearing loss	Bone conduction avg on PTA	% of patients
1.	Normal	0 – 15 dB	20
2.	Slight	16 – 25 dB	26.6
3.	Mild	26 – 40 dB	43.3
4.	Moderate	41 – 55 dB	6.6
5.	Moderately severe	56 – 70 dB	0
6.	Severe	71 – 90 dB	3.3

Table 1 – classification of patients based on degree of hearing loss.

We administered both oral and injectable multivitamins to all our patients and found that 5 (33%) out of 15 patients improved over time at a follow-up period of one month. Figure 1 demonstrates a pure tone audiogram of one such patient with improvement of almost 15 Db in hearing after

treatment. We used a paired t- test for comparison of bone conduction values before and after administering treatment and found that there was a significant improvement in hearing 1 month post treatment. (p=0.003)

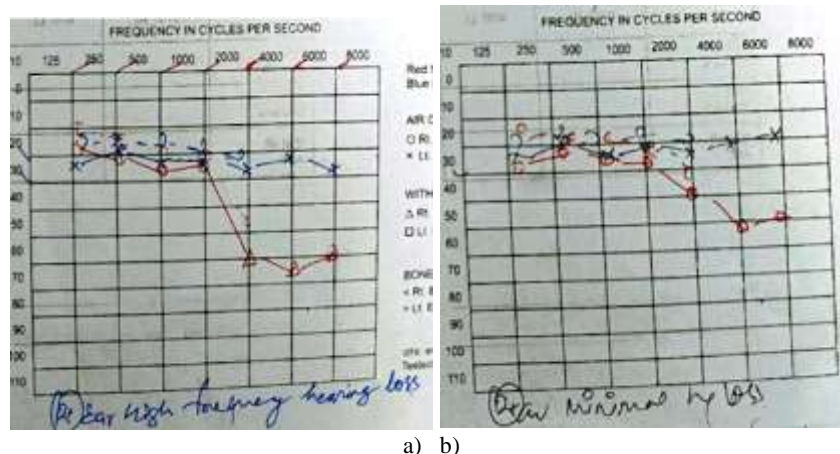


Fig. 1: Pure Tone Audiogram of a 50-year-old patient showing moderate high frequency hearing loss in right ear before starting medications (a) which improved to minimal high frequency hearing loss after 1 month of treatment (b)

Discussion

Sudden sensorineural hearing loss is defined as a sensorineural hearing loss of 30 dB or greater over at least three contiguous audiometric frequencies occurring over 3 days.⁷ Sudden sensorineural deafness is attributed to various causes like infection (viruses like herpes simplex virus, varicella zoster, CMV, EBV, HIV, mumps, rubella; bacterial causes like syphilis, meningococcus; mycoplasma; fungal causes like cryptococcus and parasitic causes like toxoplasmosis etc), trauma (head trauma, decompression sickness, temporal bone fracture, otologic surgery, perilymphatic fistula, surgical complications of neurosurgery), autoimmune diseases (exposure to certain drugs which cause hair cell damage, blood circulation problems, neurological disorders and neoplastic causes).⁸ Viral infection are a known cause of sudden sensorineural deafness and corona virus is being suspected to be new addition to such category lately. 1st case of hearing loss in SARS-CoV2 positive patient was reported on march 15, 2020 in Thailand.⁹

Exact etiopathogenesis of SSNHL in COVID-19 patients is not well known. Jeyasakthy saniasiaya¹⁰ in his review tried to explain the hypothesis behind the pathophysiology of SSNHL caused by SARS- CoV 2. He stated that the virus attaches to b chain on hemoglobin and gains entry into the erythrocytes. It is then transported to various tissues in body where it attaches to ACE 2 receptors. Since ACE 2 receptors are present in abundance in brain, medulla oblongata and temporal lobe; hearing loss ensues. Also, SARS CoV 2 after binding to erythrocytes leads to hypoxia in the hearing center and therefore may lead to permanent hearing loss. He also stated another hypothesis according to which the virus binds to ACE 2 receptors in vascular smooth muscles cells leading to clot formation. Since inner ear has end arteries, clot formation here leads to sudden ischemia and paves the way for sudden hearing loss. Varga et al¹¹ detected SARS-CoV-2 elements in endothelial cells of cochlea, with evidence for the induction of endothelial dysfunction and cell apoptosis while Harenberg et al¹² gave the hypothesis that microthrombosis at the level of auditory center in temporal lobe, the auditory nerve or the cochlea could be the cause of hearing loss post Covid19. Saussez et al gave the hypothesis that viral infection of olfactory

nervous system is believed to contribute to the pathophysiology of Covid-anosmia, in a similar way, viral infection of auditory nervous system could induce symptoms of hearing loss.¹³ Apart from this, SARS-CoV-2 is also believed to cause an increase in cytokines such as IL-1, IL-6, and TNF alpha, which causes inflammation leading to cellular stress response at the level of cochlea.¹⁴ Degen et al¹⁵ reported a case of 60-year-old man with COVID-19 pneumonia who developed complete deafness on right ear and profound SSNHL on left side with MRI findings suggesting the signs of inflammatory process in cochlea, which could have been virus triggered. Chirakkal et al¹⁶ in 2021 proposed that SARS CoV 2 infection can damage the cochlear outer hair cells and hence leads to absence of TEOAE and DPOAE. Furthermore, histological reports of patients with SSNHL have shown the loss of hair cells and supporting cells of Organ of Corti, suggesting the pathology of idiopathic SSNHL.¹⁷ Frazier KM performed a bilateral cortical mastoidectomy procedure in patients with active SARS-CoV2 infection and performed RT-PCR test on these mastoid specimens which came out to be positive thus demonstrating the presence of virus in middle ear and mastoid.¹⁸

Satar et al¹⁹ gave a criterion for hearing loss in relation to SARS-CoV2 infection which is as follows: 1. The case must be laboratory confirmed by RT-PCR for SARS-CoV-2 infection. 2. Hearing loss is documented during the downward phase of infection which is after 4 weeks since antigen-antibody complexes to viral infection form at this time. 3. Signs for vestibular involvement must be ruled out. 4. Other causes of hearing loss must be ruled out like acoustic trauma, exposure to loud noise, use of ototoxic medication during isolation period or before the period of COVID-19 infection, no history of prior otologic problems. A MRI scan of temporal lobe must be done to rule out retrocochlear lesions such as vestibular schwannoma, multiple sclerosis etc. We observed that 20% of patients had normal, 26.6% had slight SNHL, 43.3% had mild SNHL, 6.6% had moderate SNHL and 3.3% had severe SNHL. Our results can be compared to a total of 7 case reports have been published till date which are summarized as follows (Table 2)

Name of author	Degree of sensorineural hearing loss	
	Right	Left
Lang et al (2019)	Severe SNHL	Normal
Kilic et al (2020)	Moderately severe SNHL	Normal
Koumpa et al (2020)	Normal	Severe SNHL
Lamounier et al (2020)	Severe SNHL	Mild SNHL
Rhman and Wahid et al (2020)	Normal	Severe SNHL
Chern et al (2021)	Moderately severe SNHL	Profound SNHL
Chirakkal et al (2021)	Normal	Mild SNHL

Table 2: A list of case reports published till date demonstrating SNHL post Covid-19 infection

Apart from hearing loss, tinnitus is another troublesome complication post Covid 19 infection. Eldre Beukes²⁶ included 17 studies in his review on the impact of Covid19 pandemic on tinnitus in June 2021 and found that the estimated prevalence was 8%. This was between the prevalence rates reported by Almufarrij and Munro²⁷ of 14.8% and Jafari et al²⁸ of 4.5%. The onset of the tinnitus post-COVID-19 was variable. Interestingly, Davis et al²⁹ reported that the incidence increased from 11.5% at 1-week post-infection to 26.2% by week 6–7 post-COVID- 19 and

that tinnitus was one of the later symptoms to develop. Tinnitus duration also varied, with some reporting a resolution after 5 days e.g., Liang et al³⁰, Özçelik Korkmaz et al³¹, and Savtale et al³² and Davis et al²⁹ reporting tinnitus to increase in later months post COVID-19. Beukes et al³³ found that of those with pre-existing tinnitus who tested positive for COVID-19, 40% reported an increase in severity in their tinnitus, 54% reported no changes to their tinnitus, and 6% reported improvement in their tinnitus, again indicating inconsistent consequences of COVID-19

on tinnitus. We noted that out of 15 patients coming to our opd with hearing loss post-covid, 9 (60%) had tinnitus as well which was a huge prevalence as compared to the previously reported studies.

There are very limited treatment modalities for these patients which are oral and intratympanic steroids.³⁴ While oral steroids have been the treatment modality used in most cases of SSNHL, its use in SSNHL secondary to SARS-CoV2 infection is controversial. Hence, intratympanic steroids are the preferred modality in such patients. Rhman et al²⁴ in 2020 administered 3 sessions of intratympanic steroid treatment within 5 days to a patient with SSNHL secondary to SARS-CoV2 infection and showed improvement in hearing on follow-up visits. Chern et al²¹ and Koumpa et al²⁵ combined the oral and intratympanic intake of steroids for treatment and demonstrated improvement in hearing threshold and word recognition scores. Recovery of normal hearing after the administration of Oral hydroxychloroquine has also been demonstrated by a Turkish study, after prior approval from Republic of Turkey's Health Ministry.³⁵ Contradictory to these findings, there has also been a study reported by Lang et al. which showed no significant improvement after oral steroid treatment.²² We, however, could not administer oral/intratympanic steroids to our patients due to the rising endemic of steroid induced post-covid mucormycosis which was seen in our country at the time this study was being conducted. Hence, we administered oral and injectable multivitamins to our patients to aid in recovery of the hearing loss. We found a significant improvement in hearing after treatment. ($p=0.003$)

Conclusion

From our study as well as from the review of previously published study, we have come to a conclusion that SARS-CoV2 infection is a probable cause of hearing loss and tinnitus. This sudden sensorineural hearing loss can be temporary or permanent depending on the time of initiation of medical management from the development of symptoms. Most of the patients can be treated effectively if medical management is started within 24 to 48 hours of presentation of symptoms. Hence it is empirical to seek medical attention and treatment initiation within the required timeline as during this time the neural and cochlear damage is not complete and can be stopped or reversed. The patients who are unable to recover completely even after the proper treatment should be vigorously tested for the other causes of sudden sensorineural hearing loss. Those who acquire permanent deafness need to be rehabilitated with the hearing aids or cochlear implants to prevent further psychological effects of deafness in the patients. It is advisable to all the patients infected with corona virus to seek immediate medical attention when they experience symptoms of ringing sensation in ear, sudden decrease in hearing sensitivity and ear fullness to prevent the chances of permanent development of deafness.

Funding – There was no funding received from any sponsor/institution for this study.

Conflict of interests- There was no conflict of interest as declared by the authors.

References

1. WHO announces COVID-19 outbreak a pandemic, 2020. <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/who-announces-covid-19-outbreak-a-pandemic> (accessed May 19, 439 2020)
2. M.W.M. Mustafa, Audiological profile of asymptomatic 395 Covid-19 PCR-positive cases, *Am J Otolaryngol* 2020, 396 102483
3. 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(4):2300-2304
4. Chakraborty S, Maharatna S, Reddy CS, et al. Hearing loss in a post COVID-19 patient. *Int J Otorhinolaryngol Head Neck Surg.* 2021; 7:548-550.
5. 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.
6. Viola, P.; Ralli, M.; Pisani, D.; Malanga, D.; Sculco, D.; Messina, L.; Laria, C.; Aragona, T.; Leopardi, G.; Ursini, F.; et al. Tinnitus and equilibrium disorders in COVID-19 patients: Preliminary results. *Eur. Arch. Oto-Rhino-Laryngol.* 2020, 1–6.
7. Byl FM. Sudden hearing loss: eight years' experience and suggested prognostic table. *Laryngoscope* 1984; **94**(5 Pt 1): 647–61.)
8. Hughes GB, Freedman MA, Haberkamp TJ, Guay ME (1996) Sudden sensorineural hearing loss. *Otolaryngol Clin North Am* 29(3):393–405
9. Sriwijitalai W, Wiwanitkit V. Hearing loss and COVID-19: a note. *Am J Otolaryngol.* 2020; 41:102473
10. Saniasiaya J (2021) Hearing loss in SARS-CoV-2: what do we know? *Ear, Nose Throat J* 100(2_suppl):152S-154S
11. Varga Z, Flammer AJ, Steiger P, et al. Endothelial cell infection and endotheliitis in COVID-19. *Lancet.* 2020; 395(10234): 1417-1418.
12. Harenberg J, Jonas JB, Trecca EMC. A Liaison between sudden sensorineural hearing loss and SARS-CoV-2 infection. *Thromb Haemost.* 2020; 120(9):1237-1239
13. Saussez S, Lechien JR, Hopkins C. Anosmia: an evolution of our understanding of its importance in COVID-19 and what questions remain to be answered. *Eur Arch Otorhinolaryngol.* 2021; 278(7):2187-2191
14. 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(10):165889
15. Degen C, Lenarz T, Willenborg K. Acute profound sensorineural hearing loss after COVID-19 pneumonia. *Mayo Clin Proc.* 2020; 95(8):1801-1803
16. Chirakkal P, Al Hail AN, Zada N, Vijayakumar DS. COVID-19 and Tinnitus. *Ear, Nose Throat J* 2021, 100(2_suppl):160S162S
17. Merchant SN, Adams JC, Nadol JB. Pathology and pathophysiology of idiopathic sudden sensorineural hearing loss. *Otol Neurotol.* 2005; 26(2):151-160
18. Frazier KM, Hooper JE, Mostafa HH, Stewart CM. SARSCoV-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
19. Satar B. Criteria for establishing an association between Covid-19 and hearing loss. *Am J Otolaryngol.* 2020; 41(6):102658
20. Lamounier P, Goncalves VF, Ramos HVL, Gobbo DA, Teixeira RP, Dos Reis PC, Costa CC. A 67-Year-Old woman with sudden hearing loss associated with SARS-CoV-2 infection. *Am J Case Rep* 2020, 21:e927519–e927521
21. Chern A, Famuyide AO, Moonis G, Lalwani AK. Bilateral Sudden Sensorineural Hearing Loss and Intralabyrinthine Hemorrhage in a Patient With COVID-19. *Otol Neurotol* 2021, 42(1):e10
22. Lang B, Hintze J, Conlon B. Coronavirus disease 2019 and sudden sensorineural hearing loss. *J Laryngol Otol* 2020, 134(11):1026–1028
23. Kilic O, Kalciglu MT, Cag Y, Tuysuz O, Pektas E, Caskurlu H, Cetin F. Could sudden sensorineural hearing loss be the sole manifestation of COVID-19? An investigation into SARSCOV-2 in the etiology of sudden sensorineural hearing loss. *Int J Infect Dis* 2020, 97:208–211
24. Rhman SSA, Wahid AAA. COVID-19 and sudden sensorineural hearing loss, a case report. *Otolaryngology Case Reports* 2020
25. Koumpa FS, Forde CT, Manjaly JG. Sudden irreversible hearing loss post COVID-19. *BMJ Case Rep CP* 2020, 13(11):e238419
26. Beukes, E.; Ulep, A.J.; Eubank, T.; Manchaiah, V. The Impact of COVID-19 and the Pandemic on Tinnitus: A Systematic Review. *J. Clin. Med.* 2021, 10, 2763. <https://doi.org/10.3390/jcm10132763>
27. Almufarrij, I.; Munro, K.J. One year on: An updated systematic review of SARS-CoV-2, COVID-19 and audio-vestibular symptoms. *Int. J. Audiol.* 2021, 1–11
28. Jafari, Z.; Kolb, B.E.; Mohajerani, M.H. Hearing Loss, Tinnitus, and Dizziness in COVID-19: A Systematic Review and Meta- Analysis. *Can. J. Neurol. Sci. J. Can. Des Sci. Neurol.* 2021, 1–33
29. Davis, H.E.; Assaf, G.S.; McCorkell, L.; Wei, H.; Low, R.J.; Re'em, Y.; Redfield, S.; Austin, J.P.; Akrami, A. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. *medRxiv* 2020
30. Liang, Y.; Xu, J.; Chu, M.; Mai, J.; Lai, N.; Tang, W.; Yang, T.; Zhang, S.; Guan, C.; Zhong, F.; et al. Neurosensory dysfunction: A diagnostic marker of early COVID-19. *Int. J. Infect. Dis.* 2020, 98, 347–352.
31. Özçelik Korkmaz, M.; E`gilmez, O.K.; Özçelik, M.A.; Güven, M. Otolaryngological manifestations of hospitalised patients with confirmed COVID-19 infection. *Eur. Arch. Oto-Rhino-Laryngol.* 2021, 278, 1675–1685
32. Savtale, S.; Hippargekar, P.; Bhise, S.; Kothule, S. Prevalence of Otorhinolaryngological Symptoms in Covid 19 Patients. *Indian J. Otolaryngol. Head Neck Surg.* 2021, 1–7
33. Beukes, E.W.; Baguley, D.M.; Jacquemin, L.; Lourenco, M.P.C.G.; Allen, P.M.; Onozuka, J.; Stockdale, D.; Kaldo, V.; Andersson, G.; Manchaiah, V. Changes in Tinnitus Experiences During the COVID-19 Pandemic. *Front. Public Health* 2020, 8, 592878.
34. Hara JH, Zhang JA, Gandhi KR, Flaherty A, Barber W, Leung MA, Burgess LP. Oral and intratympanic steroid therapy for idiopathic sudden sensorineural hearing loss. *Laryngoscope Investig Otolaryngol* 2018, 3(2):73–77
35. Kilic O, Kalciglu MT, Cag Y, Tuysuz O, Pektas E, Caskurlu H, Cetin F. Could sudden sensorineural hearing loss be the sole manifestation of COVID-19? An investigation into SARSCOV-2 in the etiology of sudden sensorineural hearing loss. *Int J Infect Dis* 2020, 97:208–211.