

# The effect of the COVID-19 pandemic on sudden idiopathic sensorineural hearing loss: A cross-sectional study in a single center

*COVID-19 pandemisinin ani idiyopatik sensörinöral işitme kaybına etkisi:  
Tek bir merkezde kesitsel bir çalışma*

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## ABSTRACT

**Objectives:** This study aimed to evaluate the effects of the coronavirus disease 2019 (COVID-19) pandemic on the incidence, course, and prognosis of sudden idiopathic sensorineural hearing loss (SISNHL).

**Patients and Methods:** This retrospective study was conducted with 55 patients (31 males, 24 females; mean age: 44.4±18.5 years; range, 11 to 83 years) treated for SISNHL. The patients were analyzed in two groups: Group 1, which included 35 patients (24 males, 11 females; mean age: 42.5±18.8 years; range, 11 to 72 years) admitted after the onset of the pandemic between March 2020 and March 2021, and Group 2, which consisted of 20 patients (7 males, 13 females; mean age: 47.5±19.0 years; range, 20 to 83 years) admitted before the pandemic between March 2019 and February 2020. Age, the timing of referral to the otolaryngology clinic after the perception of the first otologic symptom, the severity of the hearing loss, and the status of recovery were investigated. The COVID-19 status of Group 1 was investigated.

**Results:** The incidence of SISNHL among all patients admitted to our clinic in the same time duration was found to have increased after the COVID-19 pandemic, and this increase was statistically significant ( $p=0.04$ ). One patient had SISNHL during acute COVID-19. Three patients had COVID-19 three weeks before SISNHL, six patients had COVID-19 three months before SISNHL, and one patient was diagnosed with COVID-19 six months before SISNHL. Fourteen patients were tested for severe acute respiratory syndrome coronavirus 2 with real-time polymerase chain reaction at the time of admission, which resulted in negative.

**Conclusion:** As the incidence of SISNHL has increased following the COVID-19 pandemic, a possible relation between hearing loss, presenting as SISNHL, and COVID-19 disease should be investigated.

**Keywords:** COVID-19, pandemic, sudden idiopathic sensorineural hearing loss.

## ÖZ

**Amaç:** Bu çalışmada, koronavirüs hastalığı 2019 (COVID-19) pandemisinin ani idiyopatik sensörinöral işitme kaybının (AİSİK) insidansı, seyri ve prognozu üzerindeki etkileri değerlendirildi.

**Hastalar ve Yöntemler:** Bu retrospektif çalışma, AİSİK için tedavi edilen 55 hasta (31 erkek, 24 kadın; ort. yaş: 44.4±18.5 yıl; dağılım, 11-83 yıl) ile yürütüldü. Hastalar iki grupta analiz edildi: Mart 2020 ile Mart 2021 arasında pandemi başlangıcından sonra başvuran 35 hastadan (24 erkek, 11 kadın; ort. yaş: 42.5±8.8 yıl; dağılım, 11-72 yıl) oluşan Grup 1 ve Mart 2019 ile Şubat 2020 arasında pandemi öncesi başvuran 20 hastadan (7 erkek, 13 kadın; ort. yaş: 47.5±19.0 yıl; dağılım, 20-83 yıl) oluşan Grup 2. Yaş, ilk otolojik semptomun algılanmasından sonra kulak burun boğaz polikliniğine başvuru zamanlaması, işitme kaybının şiddeti ve iyileşme durumu araştırıldı. Grup 1'in COVID-19 durumu araştırıldı.

**Bulgular:** Kliniğimize aynı süre içinde başvuran tüm hastalarda AİSİK insidansının COVID-19 pandemisi sonrası arttığı saptandı ve bu artış istatistiksel olarak anlamlıydı ( $p=0.04$ ). Bir hastada akut COVID-19 sırasında AİSİK gelişti. Üç hastada AİSİK'den üç hafta önce COVID-19 vardı, altı hastada AİSİK'den üç ay önce COVID-19 vardı ve bir hastada AİSİK'den altı ay önce COVID-19 tanısı konulmuştu. On dört hasta başvuru sırasında şiddetli akut solunum yolu sendromu koronavirüsü 2 için gerçek zamanlı polimeraz zincir reaksiyonu ile test edildi ve sonuç negatif çıktı.

**Sonuç:** COVID-19 pandemisini takiben AİSİK insidansı arttığı için AİSİK olarak ortaya çıkan işitme kaybı ile COVID-19 hastalığı arasındaki olası ilişki araştırılmalıdır.

**Anahtar sözcükler:** COVID-19, pandemi, ani idiyopatik sensörinöral işitme kaybı.

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The coronavirus disease 2019 (COVID-19) has become a pandemic over a year, and it continues to be associated with different symptoms and is considered an etiologic factor of various clinical syndromes.<sup>[1]</sup> In the field of otolaryngology, anosmia is recognized as one of the cardinal symptoms of COVID-19,<sup>[2]</sup> and hearing loss has also started to be reported in the course of the disease.<sup>[3]</sup> The pandemic has caused a great impact on the health services for non-COVID-19 diseases since the patients had difficulty referring to hospitals or avoided coming to the hospitals because of the fear of getting infected.<sup>[4]</sup> In this study, we aimed to analyze the effect of the COVID-19 pandemic on the incidence of sudden idiopathic sensorineural hearing loss (SISNHL), the disease course, and prognosis. Therefore, we analyzed two groups of patients with SISNHL before and after the initiation of the pandemic, categorized the severity of hearing loss, and recorded the time of referral to an otolaryngologist and the status of recovery.

## PATIENTS AND METHODS

This retrospective study was conducted with 55 patients (31 males, 24 females; mean age: 44.4±18.5 years; range, 11 to 83 years) treated for SISNHL at the otolaryngology clinic of the Koç University School of Medicine. The patients were analyzed in two groups: Group 1, which included 35 patients (24 males, 11 females; mean age: 42.5±18.8 years; range, 11 to 72 years) admitted after the onset of the pandemic between March 2020 and March 2021, and Group 2, which consisted of 20 patients (7 males, 13 females; mean age: 47.5±19.0 years; range, 20 to 83 years) admitted before the pandemic between March 2019 and February 2020. The total number of patients admitted to the otolaryngology clinic in the same period was also obtained. Age, the timing of referral to the otolaryngology clinic after the perception of the first otologic symptom, the severity of the hearing loss, and status of recovery were investigated. The hearing loss severity was categorized as mild, moderate, severe, and profound. The timing of referral was categorized as five days, 14 days, between 15 and 30 days, and ≥30 days. The status of recovery was categorized as no recovery, partial recovery, and complete recovery. The COVID-19 status of Group 1 was also investigated.

### Statistical analysis

Analyses were performed with IBM SPSS version 26.0 software (IBM Corp., Armonk, NY, USA). The independent samples t-test, Pearson chi-square test, and Fisher exact test were used in the assessment of parameters. A *p* value of <0.05 was considered statistically significant.

## RESULTS

Despite the lower mean age and the high number of pediatric patients in Group 1 (*n*=4 *vs.* *n*=0), there was no significant difference between the two groups regarding age (independent t-test, *p*=0.35). The incidence of SISNHL among all patients admitted to our clinic (admitted before the pandemic, *n*=8,374 *vs.* admitted during the pandemic, *n*=10,402) in the same period was found to have increased after the COVID-19 pandemic, and this increase was statistically significant (*p*=0.04). In Group 1, the severity of the hearing loss was mild in nine (25.7%) patients, moderate in four (11.4%), severe in seven (20%), and profound in 15 (42.8%) (Figure 1); in Group 2, it was mild in nine (45%), severe in six (30%), and profound in five (25%) patients (Figure 2). Although the number of patients with severe hearing loss was proportionally higher in Group 1, the difference between the two groups was not statistically significant (*p*=0.13). In Group 1, the timing of referral to an otolaryngologist was within five days in 28 patients, within 14 days in six, and ≥30 days in one patient. In Group 2, the timing of referral to an otolaryngologist was within five days in 14 patients, within 14 days in two, and ≥30 days in four patients. The timing of referral was not statistically different between the two groups (*p*=0.37). In Group 1, systemic corticosteroid treatment was administered to 33 patients,

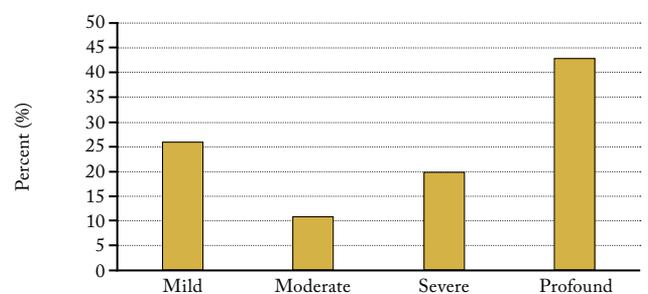


Figure 1. Severity of the hearing loss in patients in Group 1.

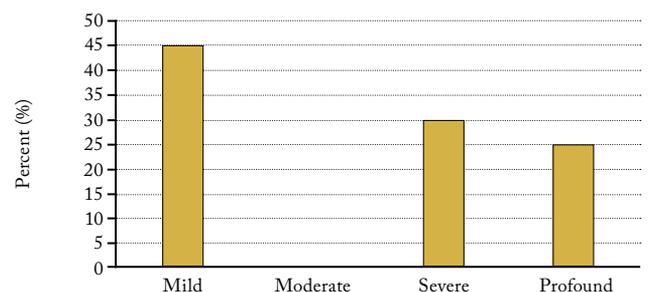


Figure 2. Severity of the hearing loss in patients in Group 2.

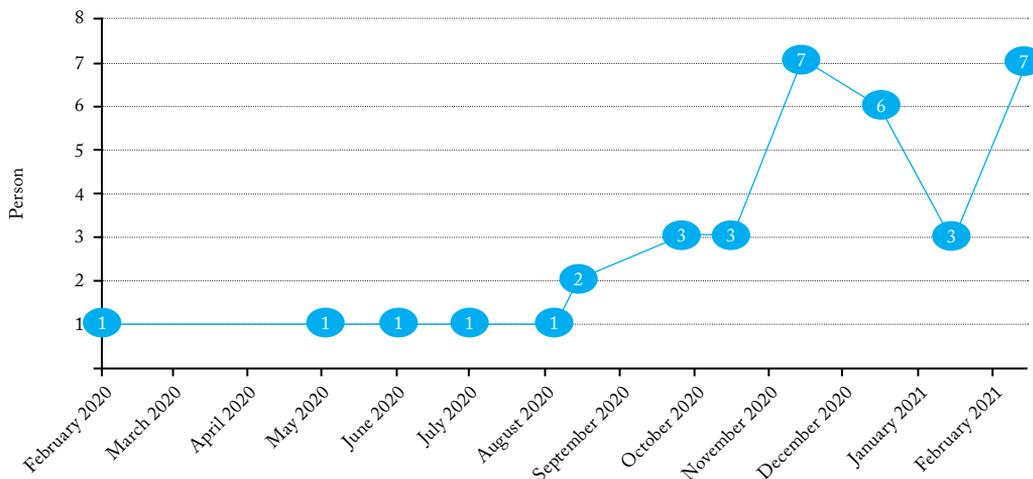
intratympanic dexamethasone injection was performed in 22 subjects, and 20 patients received hyperbaric oxygen therapy; these values were 16, five, and eight in Group 2, respectively. The control audiometry could not be obtained in six patients in Group 1 and two patients in Group 2. In Group 1, no recovery was observed in eight subjects (22.8%), partial recovery was observed in eight subjects, and complete recovery was observed in 13 (37.1%); in Group 2, the number of patients in each category was four (20%), 10 (50%), and four (20%), respectively. No statistically significant difference was found between the groups ( $p=0.49$ ). One patient had SISNHL during acute COVID-19. Three patients had COVID-19 three weeks before SISNHL, six patients had COVID-19 three months before SISNHL, and one patient six months before SISNHL. Fourteen patients were tested for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with real-time polymerase chain reaction at the time of admission, and they resulted negative. The COVID-19 status of 10 patients could not be obtained.

## DISCUSSION

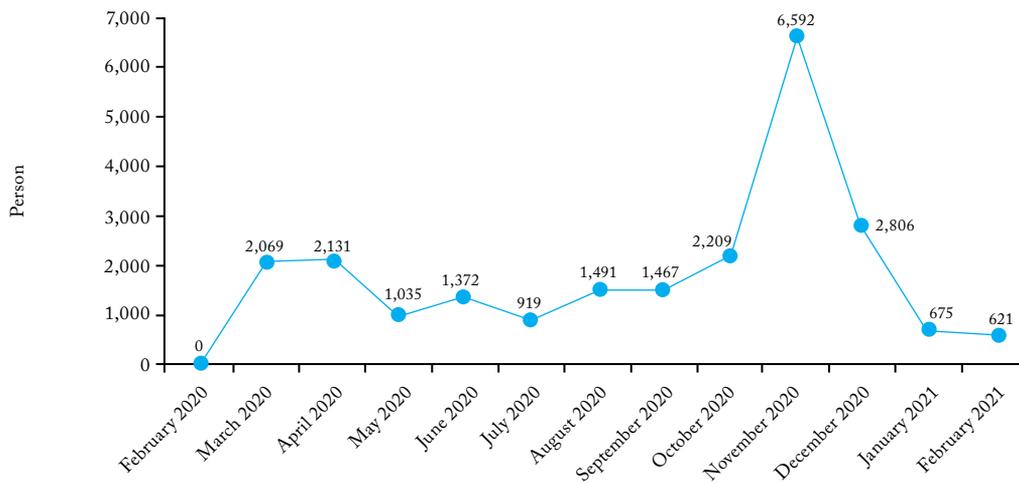
Sudden idiopathic sensorineural hearing loss is defined as a sensorineural hearing loss of at least 30 dB for three consecutive frequencies in a period of less than 72 h and is considered a medical emergency due to a need for immediate treatment. It has vascular, viral, and autoimmune etiologies. Viral infections are considered one of the most common causes of this disease, though the etiopathogenesis of viral infections in SISNHL is still unclear.<sup>[5]</sup> As we observed an increase in patients diagnosed with SISNHL and a decrease in the age of

the patients during the first year of the COVID-19 pandemic, we retrospectively analyzed the patients' data by comparing it with that of the previous year. The results demonstrated a statistically significant increase in the incidence. The data of COVID-19 patients declared by the Turkish Ministry of Health are shown in Figure 3, which reveals a prominent incline starting in October and a decline in January. This was attributed to the prevention measures, such as lockdown and masks. The curve of the incidence of SISNHL patients diagnosed in our clinic demonstrates a similar pattern to that of the COVID-19 patients in our country (Figure 4). Despite the general avoidance of referring to the hospitals during the pandemic, the patients in this group did not present in a later period as it was probably perceived as urgent for them. This might be attributed to the high percentages of severe and profound hearing loss in this group (68% in total). The patients received treatment with the same methodology as before the pandemic. At the beginning of the pandemic, there was a question about the administration of steroids for the treatment of diseases such as SISNHL and facial paralysis in general otolaryngology practice. Later, a consensus statement was also published which strongly recommended corticosteroid treatment for SISNHL patients.<sup>[6]</sup> Despite the higher percentage of severe hearing loss in Group 1, the prognosis was found to be similar between the two groups (complete recovery in 37% of Group 1 *vs.* 20% of Group 2).

In our study group, four patients tested positive for COVID-19 three weeks before developing SISNHL. The possible effects of COVID-19 infection on auditory function and consequent SISNHL have been



**Figure 3.** The number of new daily COVID-19 patients declared by the Turkish Ministry of Health between February 2020 and March 2021.



**Figure 4.** Number of monthly COVID-19 cases in our clinic between February 2020 and March 2021.

reported in some studies. One pathophysiological mechanism by which SARS-CoV-2 causes hearing loss is claimed to be through direct damage to cochlear hair cells. Mustafa<sup>[7]</sup> stated that the damage to outer hair cells was demonstrated by the reduced amplitude of the transient evoked otoacoustic emissions (TEOAEs) in the test group compared to the control group in the study, which evaluated twenty subjects with confirmed COVID-19 diagnoses for hearing loss. Koumpa et al.<sup>[8]</sup> also offered two similar pathophysiological mechanisms, the first one being cellular stress pathways, resulting in loss of hair cells and supporting cells of the organ of Corti without inflammatory cell infiltrate. Furthermore, they stated that post-COVID-19 SISNHL could be due to the binding of SARS-CoV-2 to angiotensin converter enzyme 2 (ACE2) receptors on the epithelial cells in the middle ear and the stria vascularis since they are present in mice. Given the microangiopathic events in COVID-19 patients, it is also proposed that a vascular event could lead to a cochlear dysfunction in symptomatic patients with sensorineural hearing loss.<sup>[9]</sup> However, Chari et al.<sup>[10]</sup> found that there was no significant increase in the risk of developing SISNHL in COVID-19 patients. Nonetheless, Fancello et al.<sup>[11]</sup> and Almufarrij et al.<sup>[12]</sup> suggest that the pharmacological methods used for COVID-19 treatment, such as azithromycin, hydroxychloroquine, and chloroquine, might be the culprit behind this phenomenon.

The main limitation of our study is that it was not possible to establish a cause-and-effect relationship between hearing loss and COVID-19. Another drawback of our study is that the COVID-19 status of 10 patients could not be obtained.

In conclusion, the results of our study has shown that the incidence of SISNHL has statistically significantly increased during the COVID-19 pandemic compared to the prepandemic period. As viral infections continue to be the leading cause of SISNHL, SARS-CoV2 infection should be kept in mind as a possible etiology in SISNHL cases.

**Ethics Committee Approval:** The study protocol was approved by the Koç University Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

**Patient Consent for Publication:** A written informed consent was obtained from each patient.

**Data Sharing Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Author Contributions:** Concept: S.Ü., A.M.H.; Design, analysis and/or interpretation: S.Ü.; Supervision: A.M.H.; Materials: E.A., O.A., O.G.; Data Collection and/or Processing: E.A., S.Ü.; Literature review: S.M.Ş.; Writing: S.M.Ş., S.Ü.; Critical review: S.Ü., O.G.

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