ORIGINAL RESEARCH

Assessment of hearing loss after COVID-19 infection at a tertiary centre

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ABSTRACT
Background: One of the senses that can be impacted by a number of conditions, including infectious, inflammatory, traumatic, or malignant, is hearing. A brand-new coronavirus known as SARS-CoV-2 has been affecting people all around the world for the last one year. With all others systemic derangements, hearing loss has also been documented in numerous cases. **Aim & objectives:** The present study was conducted to assess hearing loss after COVID-19 infection. **Materials & Methods:** The present cross-sectional study was conducted on 58 post covid patients of both genders. They were subjected to otoscopic examination, serial tuning fork test followed by Pure tone audiometry (PTA). Pure tone thresholds were measured in both ears. **Results:** Out of 58 patients, males were 32 and females were 26. Hearing loss was present in 30 and absent in 28. Hearing was improved in 16 and not improved in 14. Otoscopic examination was normal in 33 and retracted tympanic membrane in 25 patients. Associated symptoms were aural fullness in 21, tinnitus in 18 and giddiness in 15. Absolute bone conduction was normal in 34 and abnormal in 24 patients. The difference was significant (P< 0.05). Unilateral hearing loss was present in 21 and bilateral in 9. Degree of hearing loss is mild in 17, moderate in 12 and severe in 1. **Conclusion:** The relationship between COVID-19 and hearing loss necessitates a thorough assessment that takes into account the patient's prior hearing evaluation as well as follow-up care after the infection.
Keywords: COVID-19, Hearing, Tinnitus.

INTRODUCTION
One of the senses that can be impacted by a number of conditions, including infectious, inflammatory, traumatic, or malignant, is hearing. Some could appear idiopathic or congenital. One such reason that is known to impair hearing is viral infections.[1,2] The audiovestibular system has been known to be affected by viruses from the Herpes viridae family (herpes simplex virus (HSV), varicella zoster virus (VZV), cytomegalovirus), Paramyxoviridae (measles, mumps, and rubella viruses), hepatitis virus, and human immunodeficiency virus. Recent findings indicate that hearing impairment has been linked to the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus in a small number of populations.[3] A brand-new coronavirus known as SARS-CoV-2 has been affecting people all around the world for the last one year. It was first identified as an acute respiratory illness characterized by fever, myalgia, cough, sore throat, and dyspnoea. Later, it was discovered to impact the gastrointestinal, neurological, and cardiovascular systems. In contrast to anosmia and dysgeusia, which were prevalent symptoms among some individuals during the pandemic, hearing loss has also been documented in numerous cases. Still up for debate, though, is hearing loss linked to (SARS-CoV-2) infection.[4,5] Hearing loss may be conductive, sensorineural, and mixed type. Conductive hearing loss in a viral infection occurs as a result of middle ear effusion. However, virally induced hearing loss most commonly presents as a sensorineural hearing loss.[6]

AIM AND OBJECTIVES
The present cross-sectional study was conducted to assess hearing loss after COVID-19 infection.

MATERIALS AND METHODS
The present prospective study was conducted on 58

post covid patients of both genders at the Department of Otorhinolaryngology (ENT), Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India. All participants gave written consent after being made aware of the study. The study was approved by the Institutional Ethics Committee. The duration of the study was from February 2021 to July 2021. A treatment chart and patient data collection form with demographic details such as name, age, gender, etc., were recorded.

Inclusion Criteria

- Patients who give written informed consent.
- Patient's age between 18-60 years.
- Patients who had COVID-19 infection, post infection were asked to review in the Otorhinolaryngology Department for audiological assessment.
- Patients who had COVID-19 infection, were either asymptomatic or those who had the milder form of the illness were selected.
- Available for follow up.

Exclusion Criteria

- Patients who not give written informed consent.
- Patients with pre-existing hearing loss based on the previous audiogram report or those using hearing aids.
- Patients with middle ear infections, tympanic membrane perforation that were identified by otoscopic examination.
- All patients who had a previous history of ear surgery in the same ear, sensorineural hearing loss, congenital ear deformities, and atticoantral variety of CSOM were excluded from the study.
- Not available for follow-up.

All cases underwent a detailed clinical examination, which included otoscopy, assessment of hearing using serial tuning fork test was performed using a Gardiner Brown tuning fork followed by Pure tone audiometry (PTA). Pure tone thresholds were measured in both ears at 500, 1000, 2000, 4000 Hz and an otoendoscopic examination.

Statistical Analysis

The data thus obtained were subjected to statistical analysis. The data was analysed using descriptive statistics such as mean, standard deviation, percentages, and proportions. The Chi-square test with Yates continuity correction was used to assess categorical data, whereas the Analysis of Variance (ANOVA) was used to examine means. The findings were obtained by using suitable statistical tests utilising Microsoft Excel and the Statistical Package for Social Sciences (SPSS). A P value < 0.05 was considered significant.

RESULTS

Table I: Gender wise distribution of patients

Total- 58		
Gender	**Male**	**Female**
Number	32 (55.17%)	26 (44.83%)

Table I shows that out of 58 patients, males were 32 and females were 26.

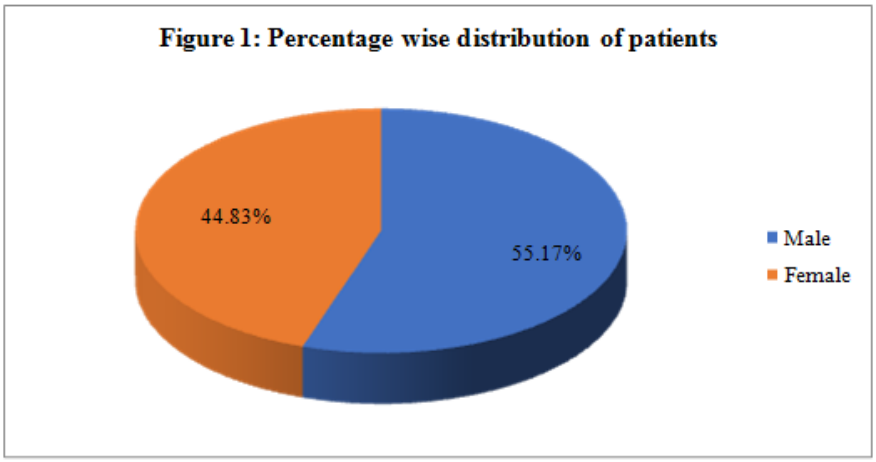

Table II: Assessment of parameters

Parameters	Variables	Number	P value
Hearing loss	Yes	30	0.86
	No	28	
Hard of hearing	Improved	16	0.91
	Not improved	14	
Otoscopic examination	Normal	33	0.75

	Retracted tympanic membrane	25	
Associated symptoms	Aural fullness	21	0.92
	Tinnitus	18	
	Giddiness	15	
Absolute bone conduction	Normal	34	0.03
	Abnormal	24	

Table II and figure 2, shows that hearing loss was present in 30 and absent in 28. Hard of hearing was improved in 16 and not improved in 14. Otoscopic examination was normal in 33 and retracted tympanic membrane in 25 patients. Associated symptoms were aural fullness in 21, tinnitus in 18 and giddiness in 15. Absolute bone conduction was normal in 34 and abnormal in 24 patients. The difference was significant (P< 0.05).

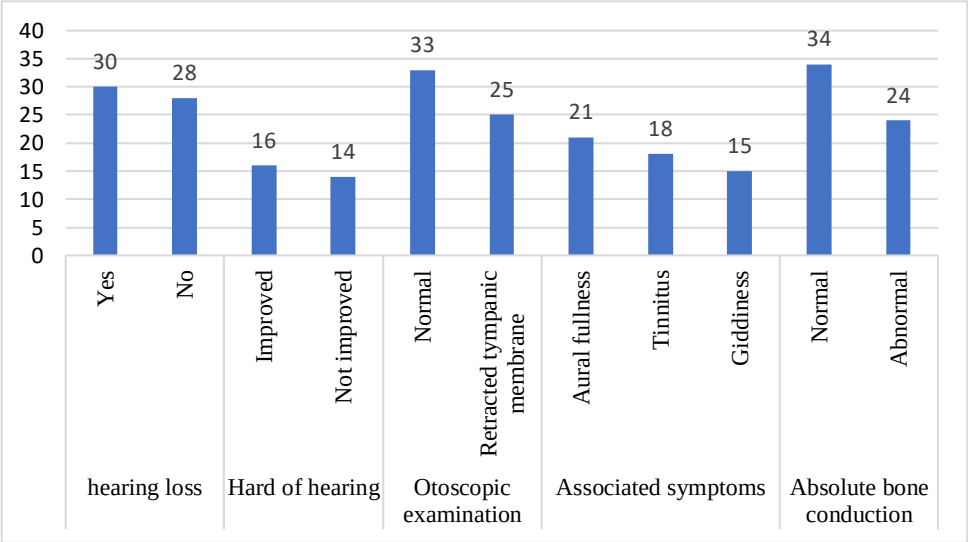

Figure 2: Assessment of parameters

Table III: Pure tone audiometry (PTA) Findings

Parameters	Number (Percentage)
Level of involvement	
Unilateral	21 (70%)
Bilateral	09 (30%)
Degree of hearing loss	
Mild	17 (56.66%)
Moderate	12 (40%)
Severe	01 (3.33%)

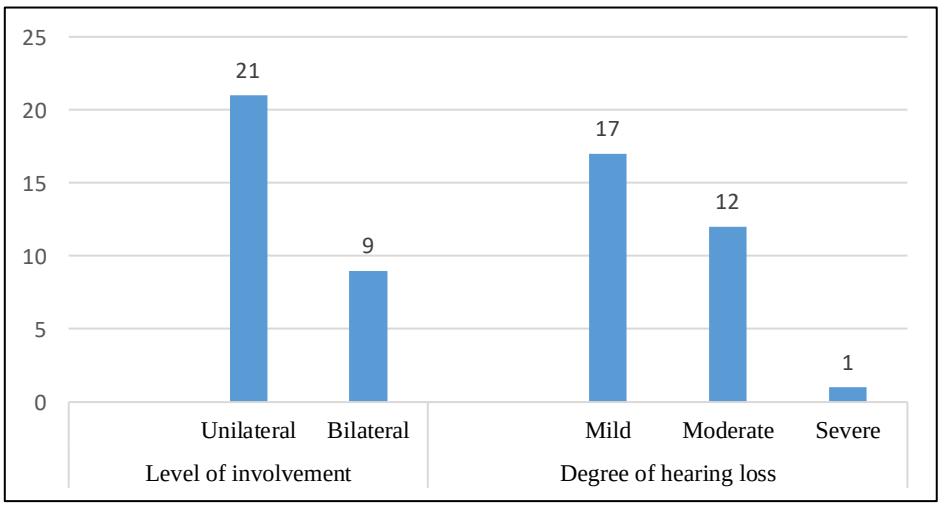

Figure 3: Pure tone audiometry (PTA) Findings

Table III and figure 3 shows that unilateral hearing loss was present in 21 and bilateral in 9. Degree of hearing loss is mild in 17, moderate in 12 and severe in 1. These data indicates that unilateral involvement is more than that of bilateral involvement and degree of hearing loss is mild to moderate are most common.

DISCUSSION

While the exact mechanism underlying sensorineural hearing loss during viral infection is still unknown, certain theories have been put out that involve direct or indirect harm to inner ear tissues.[7,8] Cytokine production from an immune-mediated response may set off another immunological reaction, severely harming the inner ear structures.[9] Another explanation for hearing loss is ischaemia, which is caused by a reduction in blood flow via the cochlear artery or labyrinthine.[10,11,12] The present study was conducted to assess hearing loss after COVID-19 infection.

We found that out of 58 patients, males were 32 and females were 26. Abraham et al.[13] determined the presence of hearing loss and its type in patients after COVID-19 infection. This study included 65 (52%) males and 60 (48%) females, and the mean age was 38.44±10.9 years. Among the 125 patients, 12 (9.6%) were diabetic, 14 (11.2%) were hypertensive, 5 (4%) had dyslipidaemia, 3 (2.4%) were hypothyroid, while remaining 91 patients (72.8%) had no comorbidities. Sensorineural Hearing Loss (SNHL) was found among 45 patients (34 with unilateral and 11 with bilateral involvement). Out of them, 2 (4.5%) were in the age group of 18-30 years, 19 (42.2%) in 31-45 years and 24 (53.3%) between 46-60 years age group. Based on the World Health Organisation (WHO) classification of hearing loss, 27 patients had mild sensorineural hearing loss, 12 patients with moderate, and six patients with moderately severe sensorineural hearing loss.

We found that hearing loss was present in 30 and absent in 28. Hearing was improved in 16 and not improved in 14. Otoscopic examination was normal in 33 and retracted tympanic membrane in 25 patients. Associated symptoms were aural fullness in 21, tinnitus in 18 and giddiness in 15. Absolute bone conduction was normal in 34 and abnormal in 24 patients. Unilateral hearing loss was present in 21 and bilateral in 9. Degree of hearing loss is mild in 17, moderate in 12 and severe in 1. Yaseen et al[14] evaluated the socio-clinical characteristics and outcome of confirmed mild- to moderate COVID-19 cases. SSNHL was identified in 26 patients, of whom 20 (76.9%) were women, 20 (76.9%) were in the age group ≥ 30 years, and 21 (80.8%) were non-smokers. Around three-quarters of the subjects were identified within the first week of deafness occurrence. Bilateral (18/26) was more common than unilateral deafness (8/26); therefore, the total number of deaf ears was 44. Besides, bilateral symmetrical deafness (13/18) outnumbered the asymmetrical type (5/18). Around three-quarters were of moderate severity. The most common otological symptom was tinnitus (25/26). The most common nose and throat symptom was anosmia (6/26). The mean hearing threshold before and after treatment with oral steroids ± intratympanic steroids was 50.91 ± 11.777 dB and 40.24 ± 15.693, respectively. One patient with bilateral SSNHL was lost to follow-up; the remaining number of deaf ears was 42, and half of them were partially improved. In this study we found that Unilateral involvement is more than that of bilateral involvement and degree of hearing loss is mild to moderate are most common. Angela Grace Abraham et al.[15], also found that prevalence of unilateral involvement is more than bilateral and mild to moderate hearing loss are mostly found in the study. The outcome of the treatment showed no statistically significant relation with the duration, side, and severity of SSNHL ($p>0.05$).

Limitation(s) of the study

The shortcoming of the study is the small sample size and the short duration of the study. Some patients showed hesitancy to attend their regular audiometry consultations due to the extremely contagious nature of the disease and the then-current pandemic, even though they had been advised of the precautions taken to ensure a sterile and safe environment.

CONCLUSION

The authors found that the relationship between COVID-19 and hearing loss necessitates a thorough assessment that takes into account the patient's prior hearing evaluation as well as follow-up care after the infection. The prevalence of hearing loss in post-COVID-19 patients with audiological symptoms is 51.72% in the present study. The degree and type of hearing loss in post-COVID-19 patients with audiological symptoms range from mild to predominantly sensorineural anacusis as the degree of hearing loss increases. The presence of a sensation of hearing loss shows a strong correlation with post-COVID-19 patients with audiological symptoms. Identifying and addressing auditory issues in post-COVID-19 patients can lead to the development of targeted rehabilitation strategies, improving their overall functional outcomes and emotional well-being. Early identification and intervention for audiological issues in post-COVID-19 patients can lead to better outcomes and lead to the development of targeted rehabilitation strategies, improving their overall functional outcomes and emotional well-being.

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