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Asymptomatic Hearing Loss A Missed Symptom in COVID-19- Before and During Vaccination Era

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Abstract

Background: COVID-19 affects different people in different ways. It had detrimental effects. The effects of COVID 19 in audiology is an interesting issue. To bring the pandemic to an end, a large share of the world needs to be immune to the virus. The safest way to achieve this is by vaccination. In this study we are highlighting the importance of vaccination and its protective effects in the auditory system.

Methodology: 35 confirmed COVID-19 positive cases formed the test group and 35 healthy age and sex matched individuals formed the control group. Of these 20 cases and 20 controls were assessed during 2020, during which there was no vaccine available for COVID and 15 cases and 15 controls were assessed during 2021, which was the era of vaccination. Their age ranged between 20 and 50 years to avoid any age-related hearing affection. Patients with diabetes, hypertension, previous history of ear disease, prolonged exposure to loud noise and family history of deafness were excluded from the study. PTA was done for both the groups on day 7 and day 30.Air conduction and Bone conduction were measured. The audiometric thresholds were measured using the modified Hughson-Westlake method.

Result: In our study conducted before the vaccination era, 9 out of 20 patients had significant high frequency hearing impairment. 7 out of the 9 affected patients showed improvement upon further testing done on day 30. In our study conducted during the vaccination era, Pure tone audiometry done on day 7 and 14 in all the patients revealed normal hearing.

Conclusion: Loss of smell and taste which was predominantly present previously is reducing now. The difference between our previous and present study can be attributed to the massive vaccination coverage among people. The severity of the illness is greatly less in vaccinated group when compared to the unvaccinated group and the virulence of the virus is decreased when it is transmitted from a vaccinated person. Thus, in this study we are highlighting the importance of vaccination and its protectives effects in the audiovestibular system.

Keywords: Audiometric evaluation, conductive hearing loss (CHL), Covid 19, pure tone audiometry (PTA), Sensoneural hearing loss (SNHL), Vaccination

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most infected people develop mild to moderate respiratory illness, some people become seriously ill and require medical attention. On 30 January 2020, World Health Organization (WHO) officially declared the COVID-19 epidemic as a public health emergency of international concern and on March 11 2020 it was

declared as global pandemic by World Health Organization (WHO) [1].

The hearing loss caused by viral infections can be acquired or congenital, bilateral or unilateral. There can be spontaneously recovery in some people [2-5]. If the viral infection has caused labyrinthitis or vestibular neuritis most probably vertigo and hearing loss can occur as a sequelae [6]. The initial symptom of presentation of COVID-19 were loss of sense of smell or taste. SARS-CoV-2 is continuing to change the more they circulate. Some variants spread more easily and quickly than other variants and the most important measure to decrease the transmission of COVID-19 infection is by vaccination. Further research in the field of COVID-19 audiology is needed for deep understanding. To explain the mechanism of hearing loss in COVID-19 patients various hypothesis have been proposed. Our study shows the audiological profile of COVID positive cases before vaccination era and during vaccination era which helped us to propose a new hypothesis that vaccination decreases the severity of the illness.

Aim:

To study audiological profile in COVID-19- PCR positive patients.

Objectives:

To shows the thresholds of pure-tone audiometry in COVID-19 PCR-positive cases before vaccination era and during vaccination era.

Materials And Methods:

35 confirmed COVID-19 positive cases formed the test group and 35 healthy age and sex matched individuals formed the control group. Of these 20 cases and 20 controls were assessed during 2020, during which there was no vaccine available for COVID-19 [7] and 15 cases and 15 controls were assessed during 2021, which was the era of vaccination. Their age ranged between 20 to 50 years to avoid any age-related hearing affection. All the following procedures was conducted for patients admitted in our hospital.

1. Detailed history taking and otological examination were carried out on all subjects before audiological testing
2. Basic Audiological evaluation. Audiometric thresholds were measured using clinical audiometer.

Study Design: Prospective study

Source of Data: Study was conducted among the COVID 19 PCR positive patients at our Hospital, during the study period.

Study Period: November 2020 to November 2021

Study Population: 35 covid patients and 35 age and sex matched control group.

Inclusion Criteria :

1. Asymptomatic and mild Covid-19 positive patients with age in the range of 20-50 years and healthy age and sex matched individuals forms the control group.
2. Nasopharyngeal or Oropharyngeal swab positive for SARS –Cov-2 infection by Reverse Transcriptase – Polymerase Chain Reaction (RT-PCR) technique.
3. COVID-19 Patients without any previous hearing disorder.

Exclusion Criteria :

1. Patient > 50 years
2. Diabetic and Hypertension patients
3. Patients using ototoxic drugs
4. Patients with family history of deafness
5. Patients with previous history of ear disease due to prolonged exposure to loud noise

Method of Study

After obtaining the clearance from ethical committee, study was started in Rajah Muthiah medical college and hospital. Total of 35 patients tested positive for COVID-19 infection and 35 healthy age and sex matched individuals formed the test and control group respectively. Of these 20 cases and 20 controls were assessed during 2020 during which there was no vaccine available for COVID [7] and 15 cases and 15 controls were assessed during 2021 which was the era of vaccination. The patients were interviewed through telephone and data regarding the age, gender, presenting symptoms (fever, cold, myalgia, cough, dyspnea, fatigability, sore throat, Hearing loss,

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anosmia, ageusia, diarrhoea) and severity of the disease were taken. The patients were followed up at day 7 and day 30.

Basic Audiological evaluation. The Audiometric thresholds were measured using a clinical audiometer. Telephonic TDH 39 from 250 to 8000 Hz was used to measure the air conduction thresholds. A Radio Ear B71 bone vibrator for frequencies from 250 to 4000 Hz was used to measure the bone conduction thresholds. Modified Hughson-Westlake method was used to measure the audiometric thresholds[8]. An informed consent was obtained from all participants. Audiological evaluation was done in a double walled, sound treated booth within permissible noise limits.

Result:

In our study conducted before the vaccination era, 9 out of 20 patients had significant high frequency hearing impairment at 4000Hz (p value 0.003), 6000Hz (p value 0.001), 8000 Hz (P value 0.001) (Fig-1).

Out of the 9 affected patients ,7 patients showed improvement during further testing done on day 30, 4000Hz (p value 0.016), 6000Hz (p value 0.017), 8000 Hz (P value 0.017) (Fig-2).

In our study conducted during the vaccination era, Pure tone audiometry done on day 7 and 14 in all the patients at 250,500,1000,2000,4000 and 8000 Hz revealed normal hearing (Fig-3).

The pure tone thresholds between the test and control group were compared using Wilcoxon signed rank test.

Fig-1: PTA test results of case and control. (Pre vaccination era)

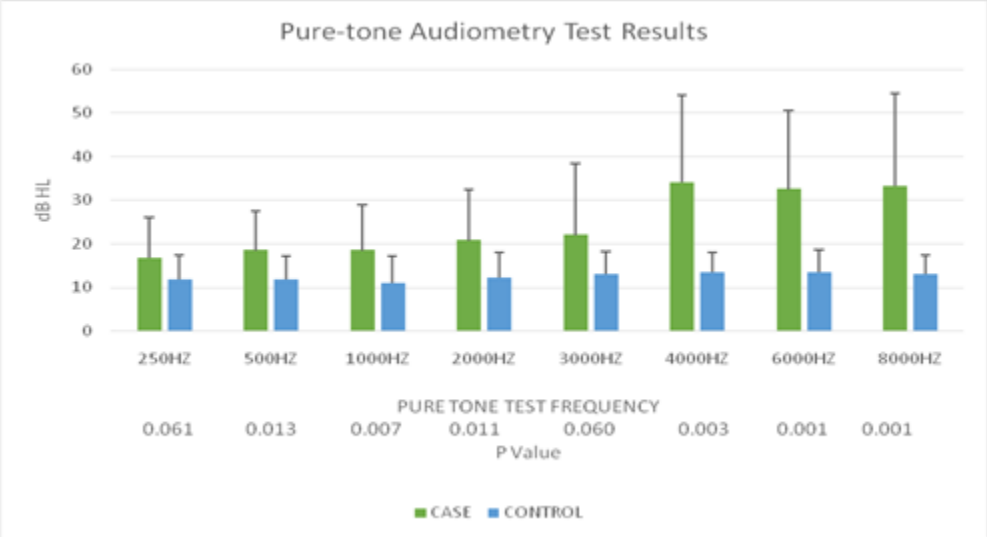

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Fig-2: PTA test Results on day 7 and day 30 (pre vaccination era)

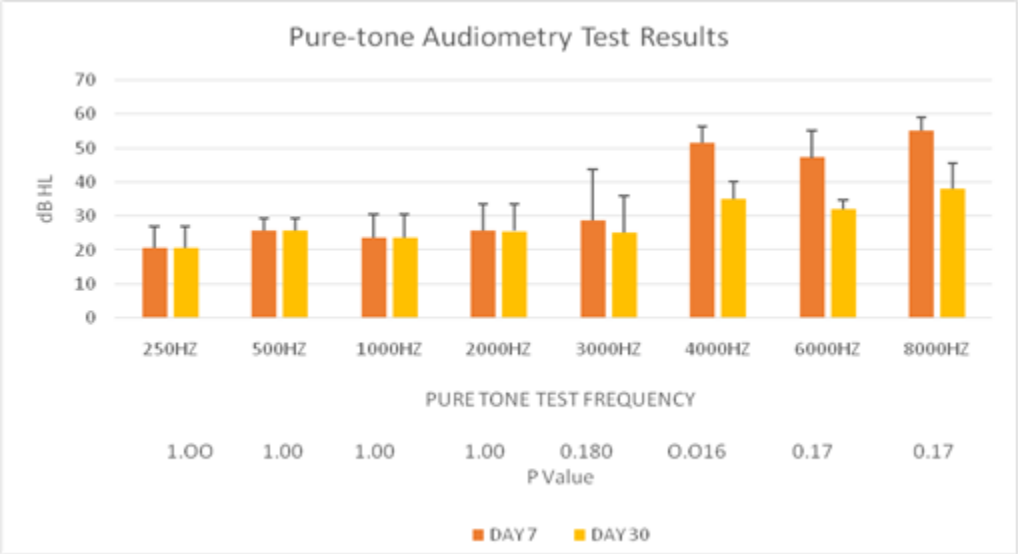
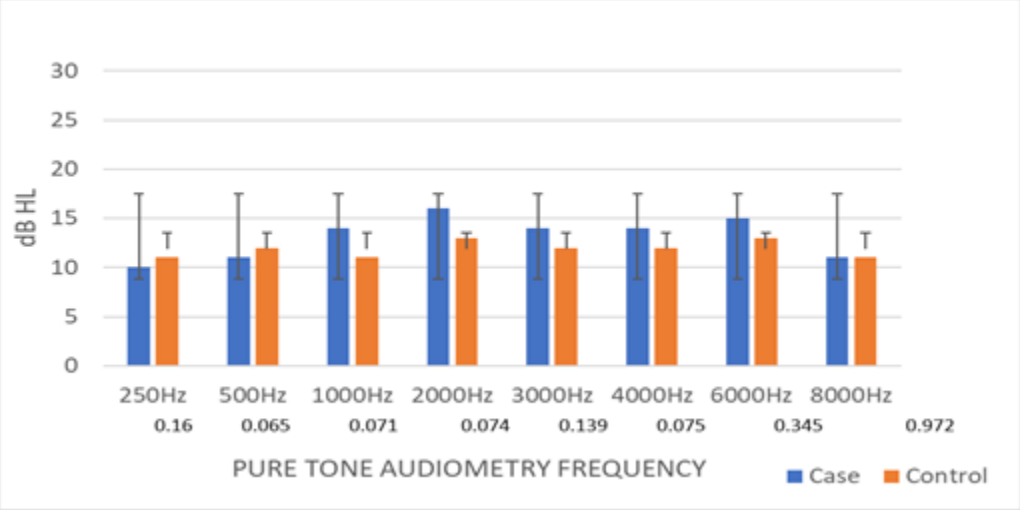


Fig-3: PTA test results of case and control (during vaccination era)



Discussion:

Multiple theories have been postulated to explain the mechanism of involvement of the auditory system ear in COVID-19 infection, these includes direct damage by the virus by hematogenous spread, inflammation of components of the auditory pathway, immune mediated damage, and ischemia theory, the presence of angiotensin converting enzyme receptors (ACE2) receptors in neurons and glial cells has also been thought to play a role in the pathogenesis [9–12]. The virus causes direct damage to the components of the auditory system by its direct cytopathic effect, cerebrovascular events caused by the cytokine strom especially in the posterior circulation can also be a major contributary factor. The therapeutic drugs which were used during the nascent pandemic like azithromycin and hydroxychloroquine may also contribute to the disorders of hearing and balance by their ototoxic nature.[13]

On April 2020 the first case of SHNL in a COVID-19 positive patient was reported by Sriwijitalai et al., [14]. Many other reports have been published relating to SNHL in COVID-19 positive patients following this report [15, 16,17,18]. A study by Mustafa et al., comparing the audiological evaluation between 20 asymptomatic COVID-19 positive patients and 20 controls revealed significant high frequency pure tone thresholds hearing loss and referred TEOAE in asymptomatic COVID 19 patients [16]. In our study done during 2020 we found that high frequency pure tone thresholds were affected in the study group when compared to the control group in the acute

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phase of illness (day 7); out of which few patients showed improvement upon further testing done on day 30 [(7)].

Surprisingly in our study conducted during the vaccination era, Pure tone audiometry revealed normal hearing. To end the pandemic, a significant proportion of the worlds population needs to develop immunity against the virus. The best and safest way to achieve this is by vaccination. Equitable access to safe and effective vaccines is critical in controlling spread of Covid-19 infection and minimizing the severity of illness and death. Safe and effective vaccines are a game changing tool. By considering this fact, major vaccination drives has been conducted in almost all parts of the nation thus increasing the vaccination coverage and to bring about a herd immunity. Vaccination is not 100% protective against the infection, some people who are fully vaccinated might still get COVID-19 infection and it is called as vaccine - breakthrough infections. The severity of the illness is greatly less in vaccinated group when compared to the unvaccinated group of people, and it is also believed that the virulence of the virus gets decreased when it is transmitted from a vaccinated person to another. The mechanism of these effects requires further research for better understanding.

Conclusion:

Two years into this Covid journey we have learnt that symptoms of this mysterious virus keeps changing. Loss of smell and taste which was predominantly present previously is reducing now. The difference between our previous and present study can be attributed to the massive vaccination coverage among people. Although Vaccine-breakthrough infections occurs, the severity of the illness is less in vaccinated group when compared to the unvaccinated group and the virulence of the virus is decreased when it is transmitted from a vaccinated person. Thus, in this study we are highlighting the importance of vaccination and its protective effects in the auditory system.

Ethical Approval: This study was approved by institutional Ethical committee.

Human or Animal Rights: It was an observational study done on the human participants after obtaining the informed consent from all the individuals.

Informed Consent: Informed consent was obtained from all individual participants included in this study.

References:

1. World Health Organization. WHO characterizes COVID-19 as a pandemic. March 11, 2020. Published.
2. Abramovich S, Prasher DK. Electrocochleography and brain-stem potentials in Ramsay Hunt syndrome. Arch Otolaryngol Head Neck Surg 1986;112(9):925–8.
3. Adler SP. Congenital cytomegalovirus screening. Pediatr Infect Dis J 2005;24(12):1105–6. [Aleksic, S. N].
4. Budzilovich GN, Lieberman AN. Herpes zoster oticus and facial paralysis (Ramsay Hunt syndrome). Clinicopathologic study and review of literature. J Neurol Sci 1973;20(2):149–59.
5. Al Muhaimeed H, Zakzouk SM. Hearing loss and herpes simplex. J Trop Pediatr 1997;43(1):20–4.
6. Goddard JC, Fayad JN. Vestibular neuritis. *Otolaryngol Clin N Am* 2011;44:361-5.
7. Sathyanarayanan, C., Swaminathan, B., Shanmugam, R., Shanmugam, V., P., Lavanya, V., & Divya, P. (2021). Asymptomatic hearing loss-a missed symptom of COVID-19. *International Journal Of Otorhinolaryngology And Head And Neck Surgery*, *7*(10), 1589-1592.
8. R. Carhart, J.F. Jerger Preferred method for clinical determination of pure tone thresholds J Speech Hear Disord, 24 (1959), pp. 330-345.
9. Maharaj S, Bello Alvarez M, Mungul S, Hari K. Otologic dysfunction in patients with COVID-19: a systematic review. *Laryngoscope Investig Otolaryngol*. 2020;5(6):1192–1196. doi: 10.1002/lio2.498
10. Chen X, Fu YY, Zhang TY. Role of viral infection in sudden hearing loss. *J Int Med Res*. 2019;47(7):2865–2872.
11. Saniasiaya J. Hearing loss in SARS-CoV-2: What do we know? *Ear Nose Throat J*. 2020;1:0145561320946902.

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12. Cure E, Cure MC. Comment on "Hearing loss and COVID-19: A note" *Am J Otolaryngol.* 2020;41(4):102513

13. 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 Dec;40(6):463-465.

14. Sriwijitalai W, Wiwanitkit V (2020) Hearing loss and COVID-19: a note. Am J Otolaryngol 41(3):102473

15. Koumpa FS, Forde CT, Manjaly JG (2020) Sudden irreversible hearing loss post COVID-19. BMJ Case Rep CP 13(11):e238419

16. Mustafa MW (2020) Audiological profile of asymptomatic Covid-19 PCR-positive cases. Am J Otolaryngol 10:102483

17. Rhman SS, Wahid AA (2020) COVID-19 and sudden sensorineural hearing loss, a case report. Otolaryngology Case Reports.

18. Degen C, Lenarz T, Willenborg K (2020) Acute profound sensorineural hearing loss after COVID-19 pneumonia. Mayo Clin Proc 95(8):1801–1803.

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