Main Article

Tinnitus in COVID-19 Era – A Study on its Association with SARS-CoV-2 and its Outcome

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ABSTRACT

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) virus mainly affecting the respiratory and circulatory system. In many, neuro-otological changes have been noted – tinnitus being one of the leading clinical manifestations which has skipped the limelight due to the other deadly complications of the disease. The study aims to assess the relation between COVID-19 infection and tinnitus, its relation with vaccination against COVID-19 and to assess the change in intensity of tinnitus at the end of 10 weeks after medical treatment in the patients with and without a positive COVID-19 RTPCR (Reverse Transcription-Polymerase Chain Reaction) report.

Materials and Methods

An institution based prospective comparative study was done in a tertiary hospital in Kolkata, West Bengal between July 2021 to December 2021. All patients aged between 18 and 65 years, with recent onset of subjective tinnitus since March 2020 (COVID-19 1st wave), were included in this study. Intensity of tinnitus was assessed at the end of 10 weeks after medical treatment with the help of Tinnitus Handicap Inventory (THI).

Results

Among the 84 patients with tinnitus - 20 had a history of (H/O) COVID-19 infection, 64 didn't. Among the 20 patients who developed tinnitus post-COVID-19 infection, 2(10%) had been vaccinated while 39 out of the 64(60.9%) patients without a had been vaccinated against COVID-19 disease. At the end of 10 weeks post-treatment, 6 out of 20(30%) patients with a H/O COVID-19 showed an improvement in THI score– of them, 2 were vaccinated while 33 out of 64(51.56%) patients without a H/O COVID-19 showed improvement in THI score – of them 28 were vaccinated against COVID-19.

Conclusion

Our study concludes that the chances of developing tinnitus is more in those who have not been vaccinated against COVID-19 and post-medication improvement of tinnitus in COVID-19 infected patients was much less than those without a history of COVID-19 infection.

Keywords

COVID-19; SARS-CoV-2; Tinnitus; Vaccination

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) virus. It mainly affects the respiratory and circulatory system. In many, neuro-otological changes have also been noted – tinnitus being one of the leading clinical manifestations which has skipped the limelight due to the other deadly complications of the disease. Tinnitus has been defined as the conscious experience of a sound that originates in the head of the owner in the absence of any acoustic electrical or other external stimulation.[1] Beukes et al,[2] in their study noted that the post-COVID-19 era has seen a rise in the prevalence of tinnitus.

The aims of this study are to assess the relation between

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COVID-19 infection and tinnitus, to assess its relation with vaccination against COVID-19 infection and to assess the change in intensity of tinnitus at the end of 10 weeks after medical treatment in the patients with and without a positive RTPCR (Reverse Transcription-Polymerase Chain Reaction) report.

Materials and Methods

An institution based prospective comparative study was done in a tertiary hospital in Kolkata, West Bengal, India during the Period from July 2021 to December 2021. All patients aged between 18 and 65 years and with recent onset of subjective tinnitus since March 2020 (COVID-19 1st wave) were included in this study. Patients with known history of middle ear and inner ear diseases, schizophrenia, organic brain lesions, previous history of tinnitus (before March'20) or objective tinnitus were excluded.

COVID-19 RTPCR reports of positive patients were collected and recorded. Type of tinnitus was determined by taking proper history and examination. A complete ear examination was performed including otoscopy, tuning fork tests and examination under microscope. A questionnaire - Tinnitus Handicap Inventory was handed over to the patients in their own language which was validated and based on the scores, they were given gradations and scores noted at Day 1, 4th week, 6th week and 10th weeks from Day 1 of visit. All patients were prescribed Tablet Methylcobalamin 1500 mcg once daily[3,4] with Tablet Gabapentin 300 mg twice daily for 10 weeks.[5] Follow up was done at 4th, 6th and 10th weeks from day 1 of visit.

Tinnitus Handicap Inventory: It is a questionnaire comprising of 25 questions–each question having 3 options: Yes (a score of 4); Sometimes (a score of 2) and No (a score of 0). The total score is out of 100 (Table I).[6]

Table I : Tinnitus Handicap Inventory

TOTAL SCORE	SEVERITY	GRADE
0-16	**Slight (Only Heard in Quiet Environments)**	**1**
18-36	**Mild (Easily Masked by Environmental Sounds and Easily Forgotten with Activities)**	**2**
38-56	**Moderate (Noticed in The Presence of Background Noise, Although Daily Activities Can Still Be Performed)**	**3**
58-76	**Severe (Almost Always Heard, Leads to Disturbed Sleep Patterns and Can Interfere with Daily Activities)**	**4**
78-100	**Catastrophic (Always Heard, Disturbed Sleep Patterns, Difficulty with Any Activities)**	**5**

The patients were assigned grades based on these scores on Day 1, 4th, 6th and 10th weeks from 1st day of visit respectively after initiation of the above-mentioned combination of drugs.

The patients were divided into two groups based on the history of COVID-19 infection and the number of them who had been duly vaccinated against COVID-19 infection was also recorded. Lastly, the percentage of patients with and without history of COVID-19 infection respectively, showing response to treatment at the end of 10 weeks was observed and all the data were compiled using Microsoft Excel 2019 and MS Word and analysed using standard statistical methods using SPSS 25 software wherever necessary.

Results

Post-COVID-19 tinnitus was subjective, mostly unilateral, persistent, non-pulsatile (Fig. 1).

Sixty-seven (67) of the total 84 patients presenting with tinnitus were male and 17 were female (Fig. 2). Of the 67 males, 3 were in the age group of 18-25 years, 1 in the age group of 26-39 years, 23 in the age group of 40-53 years, 40 in the age group 54-65 years. Of the 17 females, 3 were in the age group 12-25 years, 5 in the age group 40-53 years, 9 in the age group 54-65 years.

Twenty (20) (=23.8%) patients out of the total 84 patients who had attended the out-patient department with tinnitus had a recent history of COVID-19 infection (tinnitus onset within 4-6 weeks of covid-19 infection) while the remaining 64 (=76.2%) patients did not have a recent history of COVID-19 infection (Fig. 3).

Six (6) out of 20 patients (=30%) with history of COVID-19 infection, showed improvement in the intensity of tinnitus as shown by the change in Tinnitus Handicap Inventory score (THI) within 10 weeks of follow-up with medical treatment while 14 of them showed no changes. Thirty-three (33) out of the 64 (=51.56%) patients without a positive COVID-19 RTPCR report showed improvement in THI score post treatment at the end of 10 weeks (Fig. 4).

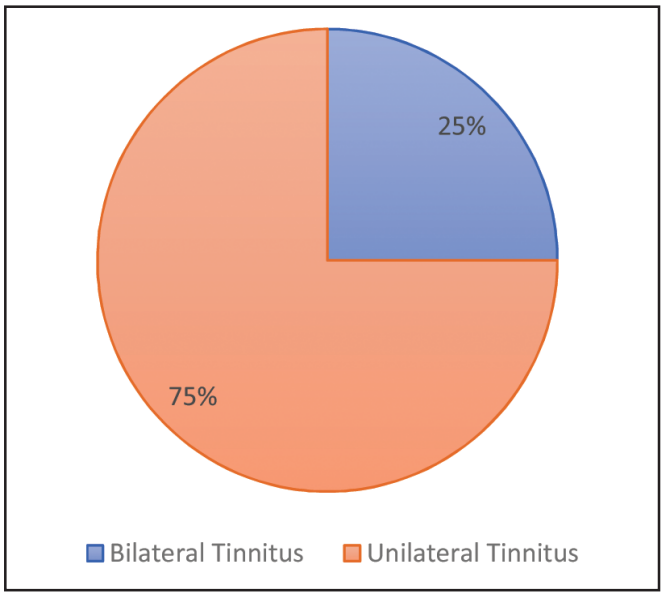

Fig. 1. Type of subjective tinnitus

Among those patients who developed tinnitus after contracting COVID-19 infection, only 2 out of the 20 patients (that is 10%) had been vaccinated while 39 out of the 64 (=60.9%) patients without a H/O COVID-19 infection had been vaccinated against COVID-19 disease.

Two (2) patients with a history of COVID-19 infection who had been vaccinated against COVID-19 showed an

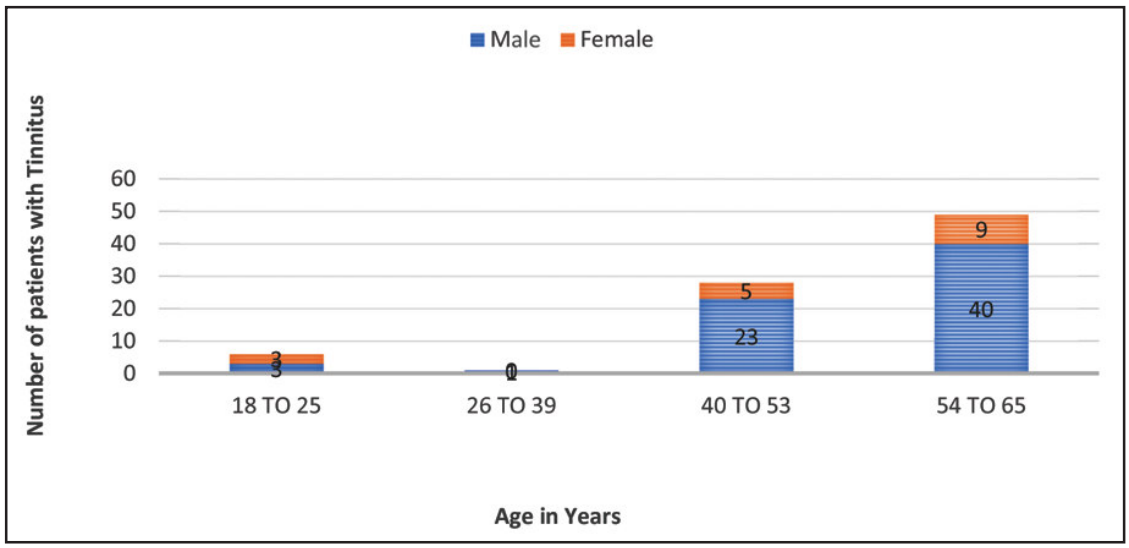

Fig. 2. Age and sex distribution

improvement in THI score at the end of 10 weeks post-treatment (Fig. 5) while 4 out of the 18 patients with COVID-19 but not vaccinated against the same showed an improvement in THI (Fig. 6). Twenty-eight (28) out of 39 patients without COVID-19 infection and with vaccination (Fig. 7) history showed improvement in THI at the end of 10 weeks post-treatment, while, 5 out of 25 patients without COVID-19 infection and without vaccination (Fig. 8) showed an improvement in THI score at the end of 10 weeks post-treatment.

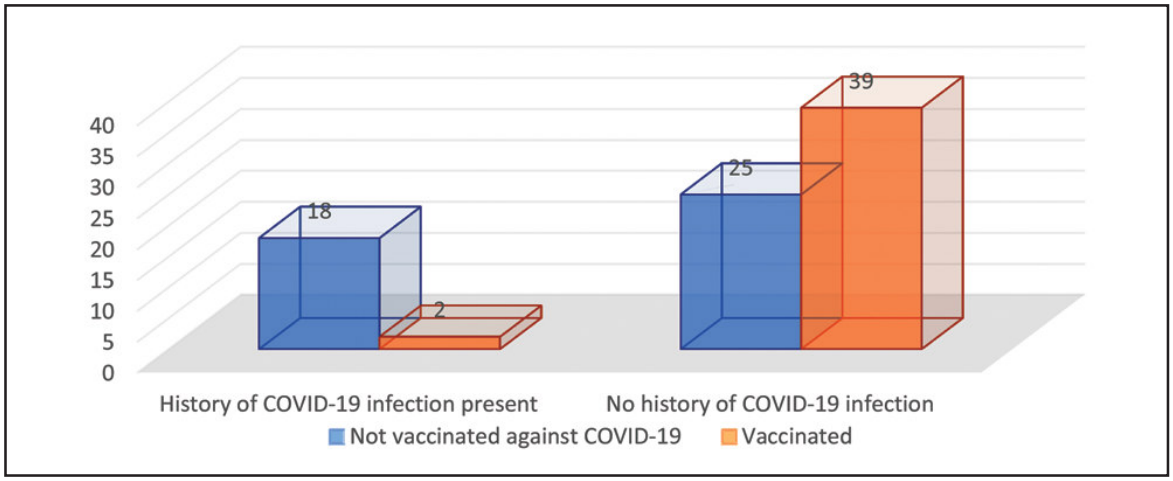

Fig. 3. Number of patients with and without history of COVID-19 infection

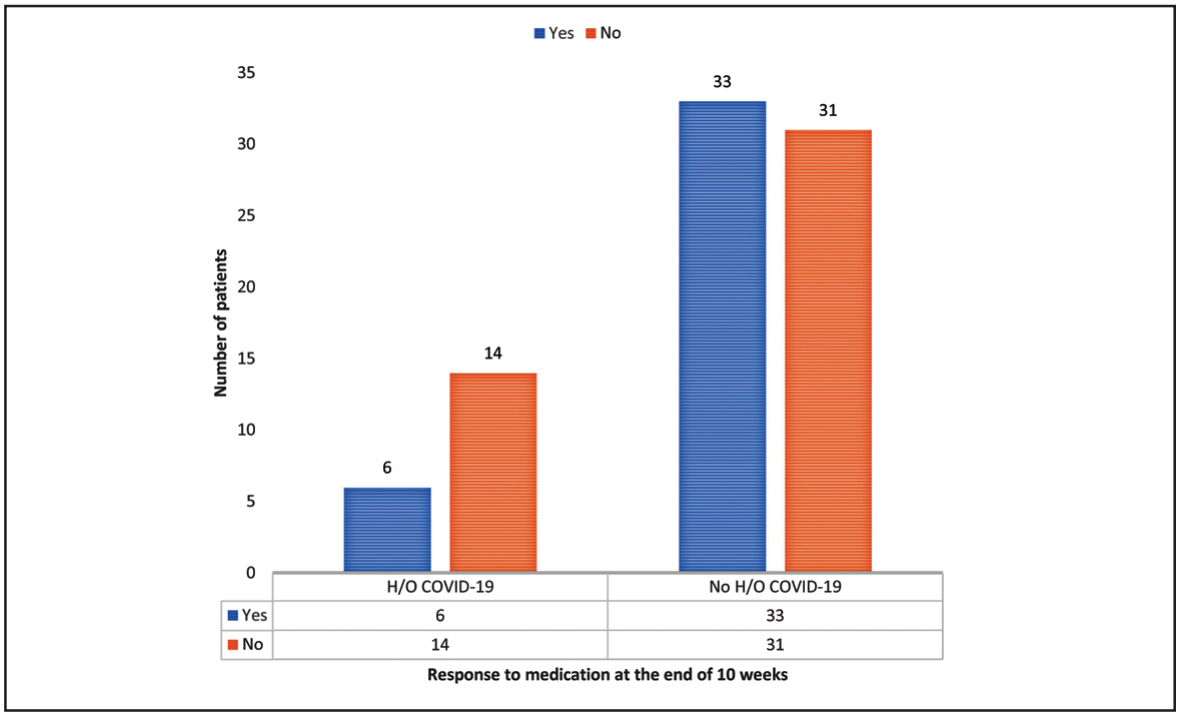

Fig. 4. Response to treatment at the end of 10 weeks. 30% patients with history of COVID-19 infection and 51.56% patients without COVID-19 have shown improvement at 10 weeks post-medication

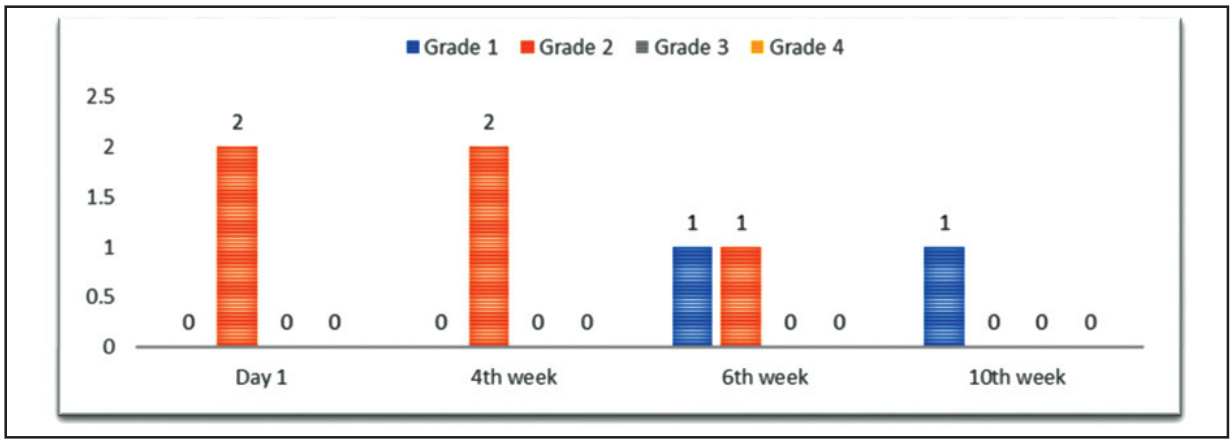

Fig. 5. Change in THI over 10 weeks post treatment in patients with COVID-19 infection and vaccinated against COVID-19

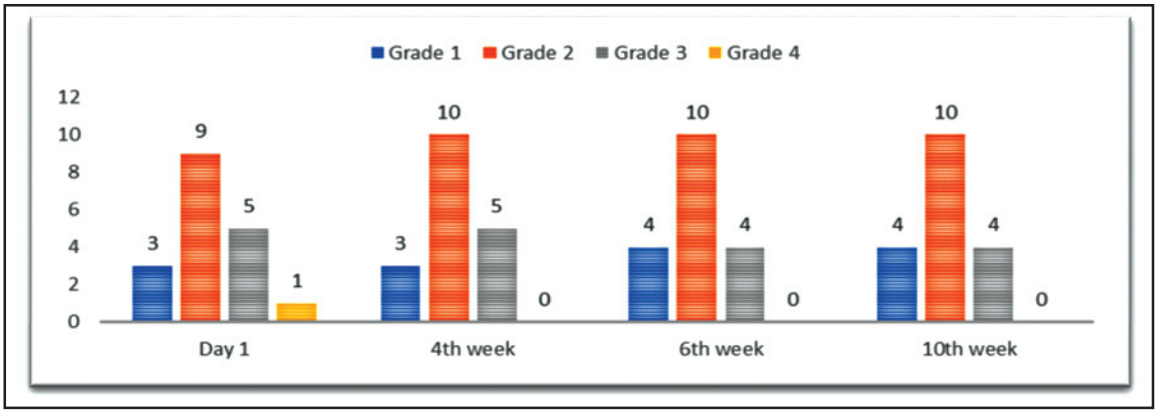

Fig. 6. Change in THI over 10 weeks post treatment in patients with COVID-19 infection and not vaccinated against COVID-19

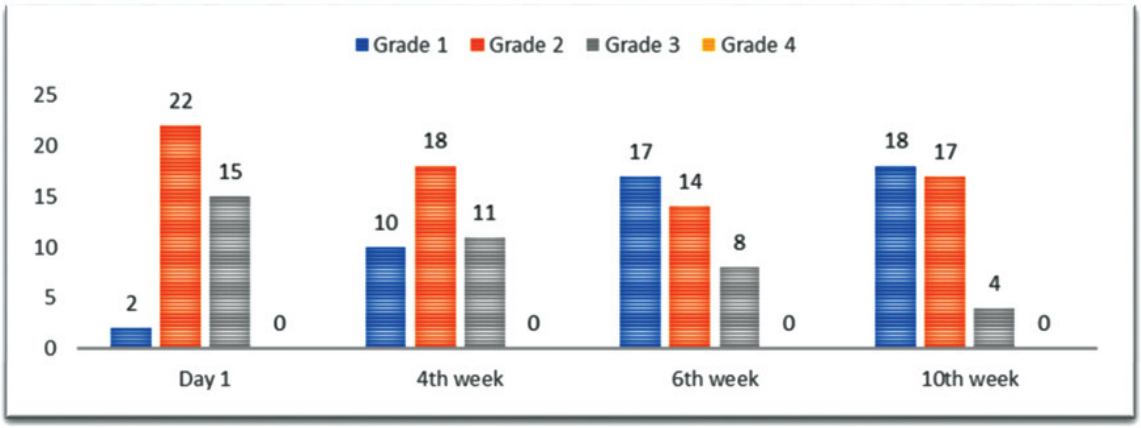

Fig. 7. Change in THI over 10 weeks post treatment in patients without COVID-19 infection and vaccinated against COVID-19

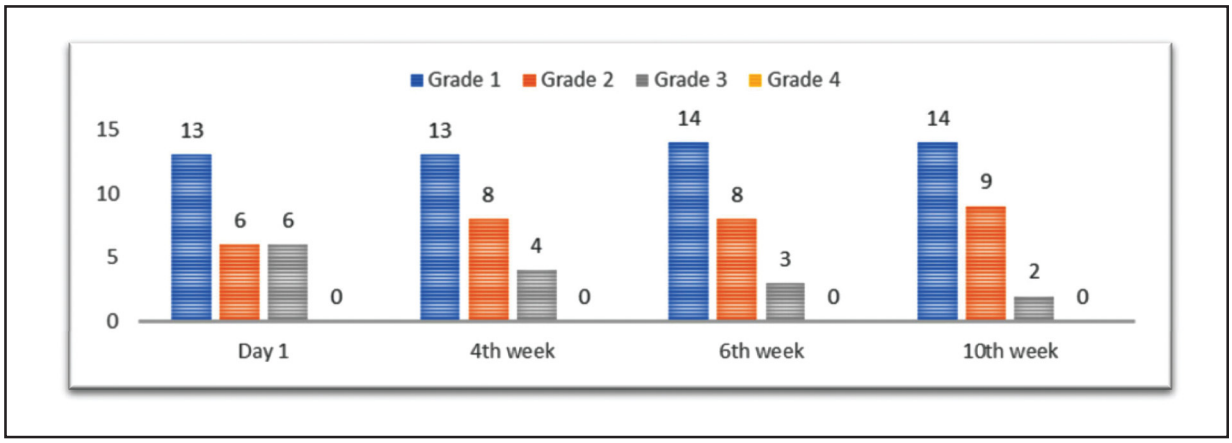

Fig. 8. Change in THI over 10 weeks post treatment in patients without COVID-19 infection and not vaccinated against COVID-19

In the 20 patients with a positive COVID-19 RTPCR report, on Day 1 of visit, the mean THI score was: 2.227, Standard Deviation (SD) was: 0.734, the Variance was: 0.539, the Standard Error of Mean (SEM) was: 0.156.

On 10th week post-treatment, the following results were noted based on the THI score: Mean: 1.9, SD: 0.7, Variance: 0.49, SEM: 0.156.

On comparing the THI values on Day 1 and 10th Day post-treatment in these 20 patients, the following were noted based on the THI score: Difference: -0.327. Standard error: 0.227. 95% Confidence Interval: -0.7865 to 0.1320. t-statistic: -1.443. DF (Degrees of freedom): 38.

A p-value of 0.1573 was obtained which means that the observed difference can be attributed to chance by 15% which is not statistically significant.

In the 64 patients without a positive COVID-19 RTPCR report, on Day 1 of visit, the mean THI score was: 2.093, Standard Deviation was: 0.744, the Variance was:0.553, the Standard Error of Mean (SEM) was: 0.093.

On 10th week post-treatment, the following results were noted based on THI: Mean: 1.59375, SD: 0.654, Variance: 0.428, SEM: 0.081.

On comparing the THI values on Day 1 and 10th week post-treatment in these 64 patients, the following were noted: Difference: -0.500. Standard error: 0.124.95%. Confidence Interval: -0.7865 to 0.1320. t-statistic: -4.036. DF: 126

A p-value of 0.0001 was obtained which means that it is going against the null hypothesis and is statistically significant.

Discussion

In our study, 23.8% of the patients who had attended the out-patient department with tinnitus had a recent history of COVID-19 infection (tinnitus onset within 4-6 weeks of COVID-19 infection). In a study done by Jafari et al[7], it could be seen that the occurrence of rate of tinnitus is statistically significant in patients with COVID-19. Chirakkal et al[8] in their study noted that COVID-19 virus damages the outer hair cells in cochlea which may lead to tinnitus. COVID-19 infection led to deleterious effects on the outer hair cells in the cochlea and there is a need for a detailed audiological diagnostic work-up in COVID-19 patients who experience isolated tinnitus and hearing loss.

Beukes et al[2] in their study noted that the post-COVID-19 era has seen a rise in the prevalence of tinnitus and that the pooled estimated prevalence of tinnitus post-COVID-19 was 8%.

Almufarrij and Munro[9] reported post-COVID-19 tinnitus prevalence of 14.8% and Jafari et al[7] reported a prevalence of 4.5%.

In our study, of these 23.8% patients, that is 20 patients, 6 of them showed slight regression of tinnitus within 10 weeks of follow-up while 14 of them showed no changes while Liang et al[10], Özçelik et al[11] in their study reported improvement of tinnitus within 5 days. Davis et al in their study noted an increase in tinnitus in later months post-COVID-19. The incidence of tinnitus increased from 11.5% at 1-week post-infection of COVID-19 to 26.2% by week 6-7 post-COVID-19.[12] In our study, among those patients who developed tinnitus after contracting COVID-19 infection, only 10% had taken vaccine against COVID-19. Post-COVID-19 tinnitus was mostly unilateral, persistent, non-pulsatile. Viola et al[13] found that tinnitus was more frequently recurrent and occasional as opposed to persistent and continuous, but less individuals were included in this study while in our study we saw that in most of the patients' tinnitus was subjective, continuous and mostly unilateral.

The improvement in the THI score, after the treatment for 10 weeks, was statistically not significant in patients with history of COVID-19, whereas the improvement in THI score was found to be statistically significant in patients who did not suffer from COVID-19.

Conclusion

Majority (75%) of the patients included in the study had unilateral, persistent, non-pulsatile tinnitus while the remaining 25% had bilateral, persistent non-pulsatile tinnitus. 23.8% of the patients with tinnitus have a positive history of COVID-19 infection. Chances of tinnitus is more in those who have not been vaccinated against COVID-19. Post-medication improvement of tinnitus in patients with COVID-19 infection was much less than those without a history of COVID-19 infection as also indicated by the statistical analysis where the p-value based on change in THI between Day 1 and 10th week post-treatment, which is not statistically significant in the COVID-19 RTPCR positive group while it is statistically significant in the COVID-19 RTPCR negative group.

Limitations

This preliminary study presents several limitations that should be considered. The absence of COVID-19 severity evaluation among patients included in the study is one such. The severity of the disease cannot be correlated to the presence of the investigated symptoms, as well as the effects of oxygen therapy on inner ear circulation that may be present in patients that underwent this type of support during treatment. The study is based on a questionnaire and the answers may have been influenced by other factors that have not been investigated such as the psychological status of the patient.

The study indicates towards an association between the two clinical entities but does not provide a definite proof that there is a cause-effect relation between them.

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