

Audiovestibular Manifestations Among Covid 19 Virus Patients

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Abstract:

Introduction & rationale: The current outbreak of COVID-19 virus can lead to fever, fatigue, cough, shortness of breath and diarrhea. Several viral infections can affect the audio-vestibular pathway and can cause audio-vestibular manifestations. The objective of our study was to assess the effect of COVID-19 pandemic on the Audio-vestibular functions.

Materials and Methods: A cross-sectional self-reported online questionnaire about audio-vestibular manifestations was carried out on 154 adult participants whom previously complaint from COVID-19 with positive Polymerase chain reaction (PCR).

Results: the mean age of participants was 30.54 years with higher predominance in females. During the infection the most common complaint was vertigo, followed by hearing loss then tinnitus. After resolution some of the affected participants reported that audiovestibular manifestations were improved mainly vertigo, and those with no manifestations during the infection not reported any audiovestibular complaint after recovery.

Conclusion: Audio-vestibular manifestations among COVID-19 should be taken into consideration as possible complaints in affected individuals. Early identification and management will help to give a better quality of life to those individuals.

Key words: COVID-19; hearing loss; tinnitus; vertigo

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INTRODUCTION

The current outbreak of COVID-19 caused by a new coronavirus (SARS-CoV2). The symptoms associated with COVID-19 include fever, fatigue, cough, shortness of breath and diarrhea. Complications include pneumonia, acute severe respiratory distress syndrome, renal failure, or even death [1, 2].

Several viral infections can affect the audio-vestibular pathway and can cause audiovestibular manifestations like hearing loss, tinnitus or vertigo. The viral infections can lead to direct damage to the structures of the ear or lead to inflammatory responses, which then cause secondary damage. The damage can be

unilateral, bilateral, temporarily or permanent [3, 4]. Although viral infections can lead to audio-vestibular damage, it is still not clear whether COVID-19 has effects on the audio-vestibular system or not. Therefore, the rationale of this study is to evaluate the impact of this novel viral infection on the audio-vestibular system. The rationale of our study is to assess the effect of COVID-19 pandemic on the Audio-vestibular functions.

MATERIALS AND METHODS

I) Participants:

In the current study adult participants whom previously complaint from COVID-19 manifestations with positive Polymerase chain reaction (PCR) for COVID-19 were enrolled. Age ranges from 18 up to 50 years and both genders were included. Exclusion criteria are those with previous history of hearing loss, tinnitus, vertigo, ear trauma, noise exposure or ear surgery.

II) Procedure:

1. Research ethics

The work was carried out in accordance with the code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and was approved by Research and studies Department-Jeddah Health Affairs, IRB registration Number with KACST, KSA: H-02-J-002, Research Number: 1507

2. Clinical Trials Registry:

The study was reviewed and approved by Thai Clinical trial Registry (TCTR) Committee on 08 March 2021 with TCTR identification number (TCTR20210310004)

3. Questionnaire:

A cross-sectional self-reported internet-based questionnaire was developed to collect data on the impact of COVID-19 on audio-vestibular functions. The questionnaire was formulated based on the information about COVID-19 available on official websites of World Health Organization and American Speech-Language-Hearing Association. The questionnaire consisted of 39 questions

divided into three items; demographic data with 5 questions, audio-vestibular complaints during COVID-19 attack with 17 questions and audio-vestibular complaints after full resolution of COVID-19 with 17 questions. The type of answers were yes or no, short answers or multiple-choice answers. To maintain privacy no personal information was collected. Then the developed questionnaire was validated by a professor of public health experts and a professor of Audio-vestibular Medicine with a minimum of 10 years of research and work experience. Then the final questionnaire was available as Google Form. The Google form started with a short description of the research then an informed consent was obtained. The responses from percipients were saved on automatically with an access to the responsible author. The data collection was carried out from 12th of March till 20th April 2021.

4. *Statistical analysis:*

Data was analyzed using IBM SPSS Statistics for windows version 20. Quantitative data expressed as means \pm standard deviation, median and range. Qualitative data expressed as number and percentage. A 5% level was chosen as a level of significance in all statistical tests used in the study.

RESULTS

The current study included 154 participants with previous attack of PCR positive documented COVID-19.

As regards the age, it ranged from eighteen up to fifty years with the mean age 30.54 (\pm 9.09). The gender distribution was higher in females it was 100 (64.9%), while in males it was 54 (35.1%).

All participants answered an online questionnaire about the audio-vestibular manifestations that may occur during or after COVID-19 affection and the results were as follow in table (1):

Table (1): distribution of participants according to auditory symptoms during & after recovery from COVID-19 illness (No. = 154):

Characteristics	During affection No (%)	After recovery No (%)	P Value
Hearing diminution			
No	141 (91.6)	146 (94.8)	0.368
Yes	13 (8.4)	8 (5.2)	
Tinnitus			
No	141 (91.6)	147 (95.5)	0.263
Yes	13 (8.4)	7 (4.5)	
Vertigo			
No	105 (68.2)	142 (92.2)	0.0001
Yes	49 (31.8)	12 (7.8)	
Earache			
No	134 (87)	144 (93.5)	0.121
Yes	20 (13)	10 (6.5)	

N.B. There was a statistically significant difference between number of participants as regards vertigo only during & after COVID19 affection.

I) Audio-vestibular manifestations during COVID-19 affection:

The commonest audio-vestibular manifestations observed in the participants during COVID-19 infection was vertigo. The characters of vertigo during COVID-19 was described in table (2). As regards hearing loss it affects thirteen (8.4 %) of the participants (table 1), it was bilateral in eleven (87.9%) of them. It was mainly of insidious onset as nine (69.2%) of the complained participants described, while it was sudden in three (23.1%) and acute in only one (7.7%). The course was variable it was stationary in seven (53.8 %), progressive in three (23.1%), regressive in two (15.4 %) and intermittent in one (7.7%) participant. Also thirteen (8.4) of the participants were experienced tinnitus (table 1), that was bilateral in twelve (92.3%). It was sudden in seven (53.8%), insidious in five (38.5 %) and acute in one (7.7%). The course of tinnitus was intermittent in twelve (92.3%) and continuous in only one (7.7%). The character of tinnitus is variable but mainly hissing in character in seven (53.8 %) participants, other experienced buzzing, roaring or hissing. Twenty (12.99 %) participants complained from earache, that was bilateral in eight (40%) of them, seven (35%) affect the right ear and five (25%) affect the left ear. It was sudden in eight (40%), insidious in eight (40%) and acute in four (20 %). The course was

intermittent in eight (40 %), regressive in eight(40 %), stationary in three (15%) and only progressive in one (5 %).

Table (2) vertigo characteristics during COVID 19 affection:

Vertigo (No.=49)	
Onset	
Acute	14 (28.6%)
Insidious	14 (28.6%)
Sudden	21 (42.8%)
Course	
Intermittent	24 (49%)
Progressive	4 (8.2%)
Regressive	12 (24.5%)
Stationary	9 (18.3%)
Duration	
Yes	29 (87.9%)
No	4 (12.1%)
Character	
Sense of imbalance & un-steadiness	26 (53.1%)
Sense of light headedness	15 (30.6%)
Sense of rotation of oneself or surroundings	8 (16.3 %)

II) Audio-vestibular manifestations after recovery from COVID-19:

After recovery from COVID-19 some of the affected participants reported that audiovestibular manifestations were persist even after complete resolution from COVID-19. On other hand, those with no manifestations during the infection not reported any audiovestibular complaint after recovery.

As regards hearing loss it persisted in eight (5.2) of the participants, it was bilateral in five (62.5 %) of them. Tinnitus was persist in seven participants and bilateral in four of them (57.1 %). Ten (6.5 %) participants still had earache, which was bilateral in three (30 %), three (30 %) affect the right ear and four (40 %) affect the left ear. As regards vestibular manifestations it was persist in twelve (7.8 %), half of them had sense of light headedness, four (33.4 %) experienced sense of imbalance & un-steadiness and two (16.6 %) complained from sense of rotation of oneself or surroundings. Overall those with vestibular complaints reported regressive course of their complaint.

DISCUSSION

COVID-19 has spread and become a serious concern throughout the world. It nearly affects the whole systems in the body. In the current study we tried to find its impact on the audiovestibular system.

In the current study the mean age was 30.54 (\pm 9.09). The gender distribution was higher in females it was 100 (64.9%), while in males it was 54 (35.1%). This was agree to some extent with study done by Virginia et al., that was done as a meta-analysis on 400 papers who reported that the mean patient age was 42.4 ± 35.1 years, while the female to male ratio was 13:7 [5] . On other hand in study done by Sandhya et al., on one hundred participants, the most affected age group was 31–40 years (31 patients) while there were 23 patients in the age group of 20–30 years and gender distribution was higher in males 58 versus 42 female patients [6].

In the current study, the most common audiovestibular manifestation found during COVID 19 infection was vertigo followed by hearing loss and tinnitus and lastly the earache.

Forty-nine participants (31.81 %) experienced vestibular affection during COVID19, the onset was sudden in twenty-one, acute in fourteen and insidious in fourteen table (2). The main description of vertigo was in the form of Sense of imbalance & un-steadiness, followed by Sense of light-headedness and lastly sense of rotation of oneself or surroundings.

Similar study was done on 509 patients from Chicago hospitals and that study reported dizziness in 29.7% of confirmed COVID 19 patients [7]. A case series from Wuhan done on 799 patients reported dizziness as a symptom in 8% of confirmed COVID 19 patients [8].

Full vestibular evaluation to COVID-19 patients is difficult to be achieved due to some factors such as the need for careful disinfection of the instruments and surrounding fields and the possibility of vomiting occurrence during the evaluation

which increases the risk of contamination, so, data about vestibular affection during COVID 19 was limited in literature [9]. Some studies documented vestibular deficit associated to COVID-19 infection, but a detailed vestibular evaluation is rarely done. Malayala et al. reported six cases of vestibular complaint with the evidence of nyctagamus in only two cases [10].

Several mechanisms can explain the vestibular affection by COVID 19. The first mechanism may be a direct viral infection of the vestibular labyrinth leading to vestibular labyrinthitis. The second one concluded that the affection may be attributed to an autoimmune reaction. The third mechanism postulated that vestibular affection was caused by blood clotting that blocks the blood supply of the labyrinth. Lastly COVID 19 can lead to orthostatic intolerance, usually as postural orthostatic hypotension [11, 12, 13].

Diminution of hearing was the second main audio-vestibular complaint in the current study it was reported in thirteen (8.4 %) participants. It was bilateral in most of them (87.9%). The main characteristics were insidious onset (69.2%), stationary course in (53.8 %).

The first documented correlation between COVID-19 and sensorineural hearing loss (SNHL) was in April 2020, since then, various cases of hearing loss either alone or in accompanied by tinnitus and/or vertigo, have been reported. However, the patient details were not provided and the association might be coincidental [14].

One case series from the United Kingdom reported that more than 10% of COVID 19 confirmed patients had noted hearing loss and/or tinnitus [15]. While Dusan et al (2021) reported hearing loss in larger percentages of patients (40%) out of 74 [16]. Kokoglu et al (2021) concluded that when hearing loss was present during COVID19 affection it did not persist on follow-up [17].

Once again, the full audiological assessment during the COVID19 was challenging because of the difficulty of controlling the infection during the tests. Hearing loss in COVID-19 patients was supposed in some researches, while it was documented in other literature with a direct correlation to COVID-19 in absence of other risk factors for hearing loss rather than the viral infection [18, 19].

The mechanism by which COVID 19 may cause hearing loss can be attributed to cranial nerve affection as happens in anosmia [20, 21], ophthalmoparesis [22] and optic neuritis [23]. Or it may be attributed to autonomic dysfunction that was provoked by COVID 19 [24].

Tinnitus was experienced in thirteen (8.4 %) of the participants, and it was mainly bilateral and intermittent (92.3%). The most common onset was sudden (53.8%), insidious in five (38.5 %) and acute in one (7.7%). The character of tinnitus is variable but mainly hissing in character in seven (53.8 %) participants. Tinnitus was described as a concomitant symptom in whole participants that complaint from diminution of hearing. This is agree with study done by Chirakkal et al., 2021 who found tinnitus in 20 COVID 19 subjects complaint from hearing loss and isolated presentations were not reported [25]. A survey was done in 185 patients with COVID-19 that had positive PCR nasopharyngeal swabs and reported that tinnitus described in 23.2% of cases [26]. In those cases tinnitus was attributed to anxiety, emotional factors and disturbed sleeps [27].

After recovery from COVID-19 some of the affected participants reported that audiovestibular manifestations were persist even after complete resolution from COVID-19. On other hand, those with no manifestations during the infection not reported any audiovestibular complaint after recovery. Table (1) showed the comparison between the number and percentages of the affected participants during and after COVID19 infection. There was a statistically significant difference between number of participants as regards vertigo only during & after COVID19 affection, which means that despite the vertigo is most common audio-vestibular manifestations that occurred during COVID19 infection, it showed marked improvement after resolution.

CONCLUSION:

Audio-vestibular manifestations among COVID-19 affected persons is turning into more and more evident. Still little information is known about the mechanisms of inner ear affection by COVID-19 virus and its pathophysiology, however, audio-vestibular complaints should be taken into consideration as viable manifestations of COVID-19 affected individuals. Early identification and management will help to give a better quality of life to the affected individuals.

More researches are needed to investigate the acute effects and the long-term complications of COVID-19 on the audio-vestibular system.

DECLARATION OF COMPETING INTEREST:

There is no conflict of interest to disclose.

LIMITATIONS:

We need to increase number of participants.

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