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Review Article

The sudden vestibular abnormalities among people with the COVID-19 infection or improved people of the COVID-19: a literature review

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ABSTRACT

The aim of this review study was to overview articles available from 2019 to 2021 to answer the question: "Is the COVID-19 associated with sudden vestibular abnormalities among people with COVID-19 infection or improved peopleof the COVID-19?" Articles included in this review were searched through the PubMed, Scopus, and Google Scholar databases from 2019 to 2021. We have utilized the search terms vertigo, dizziness, vestibular neuritis, and C0VID-19. According to the 33 available articles, the total number of patients was 363. The 95 patients (26.1%) reported dizziness, vertigo, and imbalance during the COVID-19 infection or after of the recovery. The 12 patients (12.6%) showed the vestibular neuritis, 2 patients (2.1%) indicated the cerebellitis, 2 patients (2.1%) demonstrated the benign paroxysmal positional vertigo, 2 patients observed (about 1%) with the labyrinthitis, and 1 patient (about 1%) depicted the intra-labyrinthine hemorrhage. Several studies have been reported the relationship between the COVID-19 and the vestibular system. Although more comprehensive studies are needed to investigate this matter but the evidence suggests that the COVID-19 is a neuroinvasive virus, and it is the most likely hypothesis for the cause of sudden vestibular abnormalities in the infected patients.

Keywords: Dizziness, Vertigo, Vestibular neuritis, COVID-19

INTRODUCTION

The world health organization (WHO) officially announced the COVID-19 as a pandemic disease caused by the severe acute respiratory coronavirus 2(SARS-C0V-2) in 30th January 2020. The COVID-19 is a new variant of the SARS-COV-2 from the same family and has the symptoms similar to the common cold. The polymerase chain reaction (PCR) test has a power to detect the COVID-19 infection, and a sample of the upper respiratory tract is used through the nasopharyngeal swab to perform the PCR test.[1,2]

The COVID-19 infection includes uncommon symptoms ranged from the asymptomatic to severe pneumonia and death. The common symptoms are appeared 5-6 days (range from 1 to 14 days) after infection and include fever, dry cough, fatigue, production of sputum, shortness of breath, wound throat, headache, dizziness, myalgia or arthralgia, chills, nausea or vomiting, nasal congestion, diarrhea, hemoptysis, and conjunctivitis.[1]

Specialists often observed several different clinical manifestations in addition to the initial symptoms included neurological symptoms in 36.4% of patients, central nervous system appearances (16.8% dizziness, 0.05% ataxia and 0.05% seizures), peripheral nervous system, vestibular neuritis and musculoskeletal muscle expressions.[3,4]

The most common, obvious, and highest neurological symptom of the COVID-19 is the dizziness.[5-7] The dizziness with not steady in position while walking is caused by an invasion of the acute respiratory syndrome of the COVID-19.[8]

The vestibular neuritis is a benign disorder that usually confined to the vestibular nerve. It is a inflammatory pathology that gives rise post-viral attacking the eighth cranial nerve. The symptoms of the vestibular neuritis include nausea, vomiting and vertigo.[9]

In this review, we have hypothesized that there is a relationship among the number of cases reported of the vestibular malformations associated with the COVID-19. We reviewed the available articles to provide a suitable answer to the question: "Is the COVID-19 associated with sudden vestibular abnormalities among people with COVID-19 infection or improved people of the COVID-19?"

Methodology used

Of 391 primary articles, 33 article that essentialy evaluted the relation between C0VID-19 and the vestibular system included in this review and 358 article that the C0VID-19, the dizziness and vertigo not considered excluded in this study. Articles were searched through the original, case report, letter to the editor, and review articles. We have searched the PubMed, Scopus, and Google Scholar databases from 2019 to 2021. We have considered the search terms of vertigo,dizziness, vestibular neuritis, and C0VID-19. The literature search was restricted to the English language. Figure 1 shows flowchart of the study selection. The research ethics was considered in all matters of search (IR.MUBABOL.HRI.REC.1400.141).

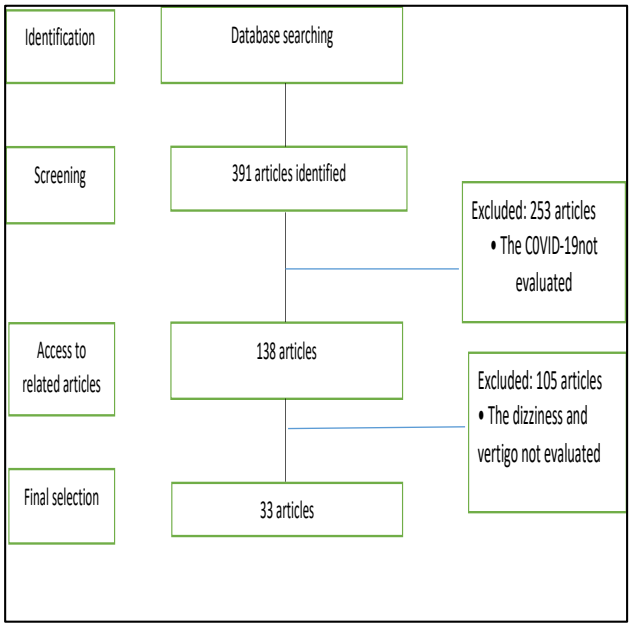

Figure 1: flowchart of the study selection. Number of articles included and number of articles excluded.

RESULTS

The total number of patients was 363, 95 patients (26.1%) reported the dizziness and imbalance during or after improving of the C0VID-19 infection. 12 patients (12.6%) of 95 patients had the vestibular neuritis, 2 Patient (2.1%) demonstrated the serbolatitis, 2 patients (2.1%) showed the BPPV, 2 patients (about 1%) indicated the labyrinthitis, and 1 patient (about 1%) depicted the bilateral intra-labyrinthine hemorrhage.

Dizziness and the COVID-19

There are significant case reports studies about the relationship between the dizziness and the COVID-19 infection.[10-12]

Studies of 141 patients with the COVID-19 showed that all patients reported the dizziness and the vertigo.[13] The another study showed that in 141.3% of patients the dizziness was one of the early symptoms of the COVID-19 and in 2 other of patients the dizziness followed by the respiratory symptoms.[11,12] In another report, the dizziness was among the 16% of people infected with the COVID-19.[14]

Another study of 145 patients admitted to the hospital with the COVID-19 found that 20% of these patients had the dizziness.[13] Extensive studies have been conducted on 214 patients with the COVID-19 in Wuhan, China. They reported that 53 patients (24.8%) had CNS symptoms and 36 patients among them (16.8%) demonstrated the dizziness.[15]

In the another study performed on 185 patients between 30 and 60 days after the COVID-19infection, 34 patients (18.4%) had an imbalance, 32 patients among them (94.1%) displayed the dizziness and 2 patients (5.9%) depicted acute vertigo.[16] Another study showed that 9 patients among 48 patients had the dizziness, the vertigo and imbalance.[17]

According to the above reports and studies, the dizziness is noteworthy to attend among the patients with the COVID-19.

Vestibular neuritis and the COVID-19

There have been reports of the acute vestibular syndromes during the COVID-19 pandemic. One of these cases is the acute vestibular neuritis in patients with the COVID-19 infection.[18]

There are several cases of the acute vestibular neuritis after the COVID-19 infection. For instance, 42-year-old man was confirmed of the COVID-19 with the severe vertigo without hearing loss. His tests results showed left-beating nystagmus and the positive right ward Romberg test. The diagnosis was the right ward vestibular neuritis.[2]

There was a report of a 60-year-old woman with the COVID-19 infection and a history of fever, cough, hoarseness, sore throat, acute dizziness without nausea, and vomiting for 9 days. The neurological examinations results were normal and the auditory-vestibular tests confirmed absence of the nystagmus. Diagnosis was the vestibular neuritis that could be a complication of the SARS-COV-2 infection.[19]

There was a report of a 63-year-old woman who experienced symptoms such as chills, nausea, dizziness, and a sense of room rotation 58 days after recovering from the COVID-19 infectionand the negative result of the PCR test. She did not complain of the tinnitus and hearing loss. The results of the videonystagmography (VNG) test confirmed the right-beating nystagmus with an involvement of the left ear. The Dix-Halpike test has shown the vertigo andthe vestibular neuritiswas definitively diagnosed.[20]

A 13-year-old girl with the COVID-19 infection complained of the sudden dizziness and persistent vomiting without any hearing loss andtinnitus. The results of the VNG test showed the spontaneous horizontal-rotational right-beating nystagmusand leftward deviation in the Fukuda stepping test. The video head impulse test showed a decrease in the gain of the vestibulo-ocular reflex (VOR) and the saccade for the left superior and lateral semicircular canal. The left upper vestibular neuritis was confirmed, and the vestibular rehabilitation was began.[9]

A 13-year-old boy reported the COVID-19 infection with the dizziness that lasted most of the day and was present at rest but it was worsened further with head movements to the left side. The results of the VNG test demonstrated the horizontal-rotational right-beating nystagmus. The neurological tests demonstrated a tendency to fall to the left side. The most likely presence of the left vestibular neuritis is due to the SARS-COV-2 infection.[21]

A 29-year-old woman reported the COVID-19 infection with complain of the sudden onset of severe dizziness and the nausea and vomiting, tinnitus, hearing loss, imbalance, and gait instability. She had no history of vertigo. The initial diagnosis was the vestibular neuritis.[22]

A 36-year-old woman showed the COVID-19 infection with complain of the sudden dizziness, nausea, and vomiting. She did not report a history of dizziness and head trauma. The Spontaneous horizontal-rotational left-beating nystagmus was confirmed without lack of external eye movement or nystagmus staring. According to the results, the right vestibular neuritis was diagnosed due to the COVID-19 infection.[23]

A 31-year-old woman was confirmed with the COVID-19 infection reported the vertigo and the dizziness that worsened with each movement and did not have any earache, tinnitus, hearing loss, and unsteady gait. The cause of vertigo was the vestibular neuritis.[24]

A 29-year-old woman was demonstratedthe COVID-19 infection with symptoms of sudden severe vertigo, nausea and vomiting. She also had a history of the dizziness during movement and rest. The dizziness persisted in all situations, but he was unable to detect which direction was getting worse. He ruled out tinnitus, hearing loss, and unsteady gait. The acute vestibular neuritis was diagnosed.[24]

A 35-year-old woman confirmed the COVID-19 infection with a history of dizziness for 4 days, lightheadedness, and loss of balance without fever, headache, vomiting, diarrhea, and earache was diagnosed with the vestibular neuritis.[24]

A 71-year-old woman with the COVID-19 infectionhad a feeling of sudden lightheadedness and loss of balance, and the severity of her symptoms worsened, lasting 15 to 20 minutes each period. It was intermittent and lasted for a month. The vestibular neuritis was diagnosed.[24]

A 57-year-old woman with the COVID-19 infection had episodes of intermittent sudden dizziness. She was diagnosed with the vestibular neuritis.[24]

These cases confirm the possibility of the vestibular neuritis by eliminating the possibility of other diagnoses. Although, more research is needed to determine its underlying bases as the acute labyrinthitis and thevestibular neuritis which is resulted fromthe COVID-19 infection.[5]

Other vestibular disorders and the COVID-19

There are other vestibular malformations in people with the COVID-19 infection such as the benign postural vertigo (BPPV), the serpentitis, the labyrinthitis, and the bilateral intra-labyrinthine hemorrhage.[1,14,26-28] Not more information is available on the incidence of the vertigo and dizziness in children with the COVID-19 infection but there have been reports of it.[29]

DISCUSSION

In this review, we have tried to explain negative impact of COVID-19 on other symtomes against typical symtoms in patients with COVID-19. Interestingly, we have observed a view of vestibular disorders and dizziness associated with COVID-19 pandemics.

Dizziness and COVID-19

We know that the COVID-19 threatens the health and has a lot of negative effects on mental, emotional and physical health.[30] Stress and anxiety are two common factors during the COVID-19 pandemic that can a possible mechanism for begging dizziness and vertigo

attacks.[1] The inner ear or the vestibulocochlear nerve is a probable target ofthe COVID-19 attack which causes the sudden sensory neural hearing loss (SSNHL), the tinnitus, and the dizziness. [31] Saniasiaya et al. reported that dizziness may to accure as a result of the SARS-COV-2 virus after the virus gain access to the neural tissue. Moreover, hypoxia was reported as a possible mechanism of dizziness.[5] Therefore, dizziness in COVID-19 may results from two main factors included hypoxia and it's direct impact on the neural tissue of the vestibulocochlear nerve.

Vestibular neuritis and COVID-19

The vestibular neuritis is an abnormality of the inner ear that characterized with inflammation of the vestibular nerve due to a viral infection. The vestibular neuritis has symptoms such as dizziness, vertigo, imbalance, sudden, and severe nausea and vomiting.[32,33] There are some reports of the COVID-19 affecting the vestibular system and the auditory abnormalities, which support the hypothesis that damage to the auditory-vestibular system during the SARS-COV-2 infection can be due to the direct damage to the inner ear structures or the immune response caused by the SARS-COV-2.[18,19,33] Thus, vestibular neuritis could be due to the COVID-19 infection or a combination of the COVID-19 with another virus such as herpes simplex virus (HSV).[24]

Other vestibular disorders

The severity of the symptoms of the COVID-19 is related to the inflammatory response when the virus enters the host cell. There is a possibility of existence of the SARS-COV-2 in the nervous system. The effect of the SARS-COV-2 on the nervous tissue can be due to direct infection of the central nervous system (CNS) or the vascular damage due to vasculitis or vasculopathy similar to which described for varicella zoster (VZV) and human immuno-deficiency virus (HIV). The virus also enters the nervous tissue through the bloodstream and binds to the angiotensin-converting enzyme receptors in the capillary endothelium. The other members of the coronavirus family have a history of attacking to the nervous system and have caused optic nerve inflammation, encephalitis, and encephalomyelitis.[1,2] Therefore, it is important to consider the function of the CNS in the onset of vestibular disorders.

CONCLUSION

According to the studies and reports from all around the world and also the neuroinvasiveproperties of the virus, we have presented the dizziness and vertigo have as one of the symptoms of the COVID-19, and we can be accepted with a high probability that the cause of these sudden abnormalities ofthe vestibule is the COVID-19. Observing a person with the sudden dizziness,vertigo and other symptoms in this pandemic can be a sign of infecting the person with the COVID-19. This can lead to faster diagnosis and treatment of the disease in these patients. More studies and comprehensive results are needed to determine the certainty of this topic.

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