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AUDIO-VESTIBULAR DAMAGE FOLLOWING SARS-CoV-2 INFECTION

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Abstract: COVID-19 has affected the world with its respiratory implications, but it is also associated with audio-vestibular symptoms, including dizziness, vertigo, tinnitus and hearing loss. This study investigated the relationship between SARS-CoV-2 infection and these symptoms, with an emphasis on the importance of early diagnosis and adequate treatment. To this end, an integrative literature review was carried out, based on a search for articles published on the PUBMED platform, between 2019 and 2023, identifying 14 articles for the final composition of this study. Several studies have highlighted the incidence of audio-vestibular symptoms in patients with COVID-19, emphasizing the need for multidisciplinary attention and care. Concluding that there is a relevant association of audio-vestibular symptoms – atypical complications – with SARS-CoV-2 infection, requiring improvement of knowledge in this area, so that there is efficient recognition and adequate treatment for these cases.
Keywords: COVID-19; Dizziness; Vertigo; Tinnitus; Hearing Loss.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a highly contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It had a catastrophic effect on the world resulting in more than 6 million deaths. After the first cases of this predominantly respiratory disease were reported in Wuhan, China, at the end of 2019, SARS-CoV-2 was rapidly spread around the world in a short period. This led to the World Health Organization (WHO) declaring it a global pandemic on March 11, 2020 (CASCELLA et al., 2020).

Transmission of COVID-19 occurs via respiratory droplets with an average incubation period of 5.1 days, with symptoms developing in an average of 11.5 days (LAUER et al., 2020). The patient usually presents with fever and dry cough and, less frequently, dyspnea, fatigue, headache, diarrhea, nausea and hemoptysis. In more serious cases, it can lead to acute lung injury, multiple organ failure and death (NUNES et al., 2020).

Although some patients recover spontaneously or after acute phase treatment, many studies are now focusing on the long-term complications of COVID-19 (MONTANI et al., 2022). The sequelae of COVID-19 infection, especially in the neurological, respiratory and cardiac systems, after 4 weeks of infection, were called post-covid-19 syndrome (NALBANDIAN et al.,2021). These symptoms appear frequently and do not only affect those who have experienced the most severe forms of COVID-19 (MONTANI et al., 2022).

Some time after the start of the COVID-19 pandemic, patients infected with the virus began to present neurosensory disorders. Among these symptoms, the main highlights were anosmia and dysgeusia - present in around 15% of infected humans -, in addition to audio-vestibular dysfunctions, which presented as tinnitus, vertigo and hypoacusis (HU et al., 2020) (JEONG et al.,2021). Based on these symptomatic presentations of Sars-Cov 2, it is possible to relate the tropism of the virus to neurosensory systems. (CHIRAKKAL et al., 2021)

Studies indicate the ability of the Sars-Cov 2 virus to infect cells of the audio vestibular system, both in the external and middle ear. Even if certain people do not develop otitis, the presence of the virus was still verified in autopsies of patients who died as a result of Covid-19 infection, due to the presence of receptors that express ACE2 (angiotensin-converting enzyme 2) and the TMPRSS2 enzyme (SOUSA et al., 2021). Both this receptor and this enzyme are present in the nasal mucosa, as well as in the middle ear,

Eustachian tube and cochlea and are largely responsible for allowing the infection to occur. In addition to these, it is notable to mention the connection of the Sars-Cov virus with the ACE-2 receptor, also present in the epithelial cells of the middle ear. (URANAKA et al., 2020) (JEICAN et al., 2021)

In this context, it is also worth mentioning how hearing impairment occurs in patients infected with COVID-19. The forms of presentation, mainly of hearing loss and tinnitus, are varied, both in speed of onset and presentation of the symptom itself, as well as in the severity of the otological manifestation. There are reports of hospitalized patients who had these occurrences insidiously, as well as others who were affected suddenly, varying in the severity of these signs. (SOUSA et al., 2021)

Thus, this study aims to demonstrate the relationship between audio-vestibular symptoms associated with COVID-19 infection, through an integrative review of the bibliographic material on the topic. Focusing on enriching scientific production on the subject, it is essential to develop studies that address the topic with clarity and didactics to support future work in the area.

METHODOLOGY

The study in question aims to carry out an integrative literature review, in which articles systematically searched on the PUBMED platform were used. This research was based on the search for the following key words: "covid 19", "dizziness", "tinnitus", "hypoacusis" and connected by the Boolean "and". Based on this, a period was defined, covering the years 2019-2023. Finally, a total of 14 articles were found for the final composition of this study.

We used as inclusion criteria studies that demonstrate the proven relationship between the infection caused by the Sars-Cov 2 virus and audio-vestibular symptoms, including hypoacusis, tinnitus and vertigo. In addition to these, we also searched for texts that explained the epidemiology, pathophysiology and symptoms caused by Covid-19. Studies in English and Portuguese were covered, within the stipulated period between 2019-2023. Furthermore, we value articles with a large number of citations. Finally, we were inclusive of all genders, races and ethnicities from the most diverse socioeconomic conditions to analyze the relationship proposed by the authors of this work on a global basis.

On the other hand, studies that were not related to Covid-19, articles that did not have a large number of citations and also those that were not related to the proposed theme of this review were used as exclusion criteria.

Finally, among the 46 articles found, they were subjected to a careful analysis by all members of this study in question, then the Mendeley software was used with inclusion and exclusion filters, as described above. After that, the 15 articles found were reviewed, which were used to compose this study.

RESULTS AND DISCUSSION

A multicenter study published in Europe aimed to analyze the incidence of otorhinolaryngological changes in patients infected with Sars-CoV-2, namely tinnitus and dizziness. During the period from May 5th to June 10th, 2020, in 15 Italian hospitals, data were collected on the prevalence of such comorbidities in patients, which reflected in 185 individuals studied. Of these patients, 34 (18.4%) reported changes in balance after the diagnosis of COVID-19 and, of these 34, 32 (94.1%) reported dizziness and 2 (5.9%) reported acute manifestations of vertigo. 43 (23.2%) patients reported tinnitus and 14 (7.6%) reported tinnitus and dizziness concomitantly. (VIOLA et al., 2020)

Another study carried out in Germany, between September 2021 and January 2022,

provided an online form on the SoSci Survey platform, so that patients, hospitals and private clinics could participate, with these participants having to be at least 18 years old and with symptoms of vertigo/dizziness (for this study classified as synonyms) and prevalent tinnitus for more than 4 weeks after confirmation of SARS-CoV-2 infection, by PCR, positive antibodies or antigens. During the questionnaire, the participant could evaluate, on a scale of 0-10, the intensity of the symptoms, with 0 indicating absence and 10 indicating extremely intense symptoms. In this present study, data was collected from 1082 patients, 94% of them stated that contamination by SARS-CoV-2 was confirmed by the PCR method and, of the total number of patients, 72.9% were female. 9.8% of all participants, with an acute infection, were hospitalized and, of these 9.8%, 2.4% required intensive treatment. 15% of patients had two doses of the vaccine before infection. Thus, of the 1082 patients, 60% reported having suffered some degree of vertigo/dizziness and 30% tinnitus. 24.6% reported both symptoms and 25.4% reported no symptoms. Regarding the intensity of symptoms, 30.6% claimed an average intensity of 4.8, whose standard deviation was 3. Tinnitus was classified as lighter intensities, however, 23% responded that the tinnitus was intensity 8 or greater. The average severity of vertigo/dizziness reported by patients was 4.6, with a standard deviation of 2.7. Added to this is that 20% of patients with vertigo or dizziness rated the severity of their symptoms at 8 or higher. (DEGEN et al., 2022)

In addition to the two studies mentioned above, a third study was carried out at the Tikrit General Hospital, in Iraq, by the Otorhinolaryngology department. This aimed to report the presence of sudden sensorineural hearing loss related to COVID-19 and lasted from December 1, 2020 to June 30, 2021. The patients included in the study were those who presented a mild to moderate degree. of the disease, which was confirmed by PCR. Furthermore, age, gender and smoking habit were considered, as well as clinical characteristics that include the onset of symptoms, duration of deafness, laterality, severity, presence of comorbidities and symptoms associated with other anatomical parts, such as the ear, nose and throat. In addition, the result after treatment with steroids was recorded. Therefore, 26 patients met the study criteria, of which 20 (76.9%) were women and, of these 26, 20 (76.9%) were aged 30 or over and 21 (80.8%) %) denied smoking. Approximately 20 patients were identified when deafness manifested itself in the first week, and 18 patients out of all had bilateral deafness. 20 patients also presented a moderate degree of the disease. 25 patients were affected by tinnitus, in addition to the most common throat and nose symptom being anosmia, which was present in 5 individuals. During follow-up, one patient was lost, so that the total number of deaf people became 42 and half of these patients showed partial improvement. However, under treatment bias, the study did not reveal a statistically relevant relationship between the duration, laterality and severity of symptoms ($P>0.05$). (YASEEN et al., 2021)

Finally, another study related to sudden sensorineural hearing loss related to COVID-19 was carried out in the United Kingdom. This study was based on literature from the medical records of the otorhinolaryngology clinic after March 11, 2020 with sudden sensorineural hearing loss and which tested positive for Sars-CoV-2. Complementary exams such as audiometry were used in association with previous clinical history. Therefore, 4 patients were selected for the study. 3 (75%) had bilateral deafness, and 2 (66.6%) of these 3 had worsening at higher frequencies. The patient

who developed unilateral loss was affected by a more severe condition of COVID-19 and, even after treatment with IV and oral steroids, developed unilateral loss. (SHAH., 2021)

These results point to a significant association between SARS-CoV-2 infection and changes in the otorhinolaryngological system. A significant proportion of patients reported experiencing dizziness and tinnitus after being diagnosed with COVID-19. The prevalence of dizziness was higher than vertigo in all studies, suggesting that dizziness may be a more common manifestation of these changes. Furthermore, some patients reported both symptoms simultaneously, indicating a possible association between them in the progression of the disease (YASEEN et al., 2021).

Sudden sensorineural hearing loss is also highlighted as a possible complication in patients with COVID-19. Although this manifestation was less frequent than dizziness and tinnitus, it was observed in patients with mild to moderate degrees of the disease. Bilateral deafness was prevalent, and, in some cases, unilateral hearing loss worsened at higher frequencies, suggesting a possible negative impact of the viral infection on hearing function (YASEEN et al., 2021).

These results also highlight the importance of health professionals being aware of atypical complications of COVID-19, relying on early recognition and adequate treatment of these manifestations. Although it is predominantly known for its respiratory symptoms, studies have revealed a wide range of complications in different body systems. ENT changes are just one of the many types of complications reported in infected patients; Therefore, constant vigilance by healthcare professionals to identify such complications is crucial to offering holistic and comprehensive care to patients.

Knowledge of these atypical complications also allows for accurate diagnoses, timely interventions and specialized referrals, ensuring that patients receive appropriate treatment and reducing their negative impact on the progression of the disease and the quality of life of affected individuals. Furthermore, raising awareness about the possible atypical manifestations of COVID-19 contributes to the advancement of scientific research and the construction of a more comprehensive understanding of its effects on the body.

It is important to note that the studies cited have some limitations. The sample size varied between them, which may affect the generalization of the results. Furthermore, the period of follow-up of patients after infection also varied, which may have influenced the detection of persistent symptoms. In the study carried out in Iraq, no statistically relevant correlation was found between the duration and severity of hearing loss symptoms, which suggests the need for further investigation.

CONCLUSION

The studies analyzed reveal a significant association between SARS-CoV-2 infection and audio-vestibular symptoms, such as dizziness, vertigo, tinnitus and sudden hearing loss. A multidisciplinary approach is essential in monitoring and treating these patients, and additional research is needed to understand the underlying mechanisms and develop effective prevention and treatment strategies. These findings emphasize the importance of careful attention to these complications to improve the quality of life of post-COVID-19 patients.

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