International Journal of Community Medicine and Public Health
Hussain T et al. Int J Community Med Public Health. 2022 Oct;9(10):3845-3848
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20222385

Systematic Review

COVID-19 and sensorineural deafness: systemic review

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Received: 08 September 2022
Revised: 12 September 2022
Accepted: 15 September 2022

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ABSTRACT

Coronavirus is a pandemic that hits the world when least expected, causing health chaos. A plethora of evidence from recent studies indicates that the novel coronavirus (COVID-19) disease has led to various health problems. For instance, a range of neurological symptoms may worsen in the event of a Coronavirus infection. The virus is linked to sudden sensorineural deafness also (used in this article) known as (SSNHL) sudden sensorineural hearing loss. Studies indicate that due to the vulnerability of the inner ear to viruses, SSNHL is believed to develop after severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) exposure, frequently leading to prolonged morbidity and deterioration of quality of life. This is because otologic symptoms relating to SSNL outlined in patients with coronavirus infection. However, no definitive link has been found between COVID-19 and SSNHL. This systematic assessment investigated the relationship between the prevalence of SSNHL and COVID-19 disease. Additionally, the review utilizes patients having coronavirus-related sudden sensorineural hearing loss from the ENT outpatient department; all the patients in this review are at least 18 years of age. Sensorineural deafness generally appeared within a couple of days and two months following the COVID-19 diagnosis, while some individuals experienced it prior to the detection of COVID-19. As previously stated, the purpose of this article is to conduct a systematic literature review to assess the potential link between COVID-19 infection and SSNHL. SARS-CoV-2 might impair cochlear function, according to existing evidence; however, the evidence is scarce. To assess the long-term impact of this virus on the inner ear, substantial cohort and potential investigations are required.

Keywords: Sudden sensorineural hearing loss, COVID-19, SARS-CoV-2

INTRODUCTION

COVID-19 was first discovered in Wuhan, China, in December 2019. Since its discovery, this lethal virus causing severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) disease has hit the world, World Health Organization declared it as pandemic in early 2020.[1] On 28 May 2020, there were over 5.7 million confirmed cases and over 350,000 covid related deaths globally.[2] Many individuals have been affected and many more continue to suffer from the short term as well as long-term impacts of SARS-CoV-2. According to Fancello et al, "neurological symptoms have been reported to be present in more than 80% of severe cases and could be related to the virus' neurotropic and neuroinvasive properties".[2] The inner ear is very susceptible to viruses, and multiple studies showed the evidence that SARS-CoV-2 is linked to sudden sensorineural hearing loss (SSNHL). Sudden sensorineural hearing loss is defined as abrupt hearing impairment of 30 decibels or more extraordinary at three successive frequencies over three days. SSNHL is generally idiopathic, although it can also be caused by other viral infections, autoimmune diseases i.e., vasculitis, malignancy, or chronic illness.[1,3] In April 2020, Sriwijitalai and Wiwanitkit presented the initial link between COVID-19 and sensorineural hearing loss, since then, the emphasis on how the virus impacts the inner ear has been risen.[2,4] According to Meng et al, "strong evidence suggests that

viral infection is a cause of SSNHL. It may be related to direct effect of virus on the labyrinth or the cochlear nerve, reactivation of latent virus inside spiral ganglia, and immunoregulation of systemic viral infections. Historically, Lassa fever, mumps, adenovirus, and other viruses have also caused SSNHL".[4] Therefore, this study aims to assess coronavirus' effect on sudden sensorineural hearing loss and to give insight into the COVID-19- related SSNL clinical aspects.

Objectives

Hearing loss is the important health concerns which cause many other infections and aging. During the COVID-19 pandemic the life style of the people was much changed. The main objective of this study was to know about the severity of the SSNHL during the COVID-19 pandemic and this study was based to elaborate the link between SSNHL and COVID-19 pandemics and to provide an understanding of the clinical characteristics of COVID-19-related SSNHL.

METHODS

Methods and search strategy

The systematic review is conducted on the basis and guidelines provided by the supervisor consultant, as it involved reviewing the literature, ethical consideration and formal approval was not mandatory. This article selectively explored peer-reviewed literature databases such as Taylor & Francis Online, NCBI, MDPI, Sage journals, ELSEVIER, BMJ, and PubMed. The searches regarding the topic were limited to specific keywords, including sudden sensorineural hearing loss, COVID-19, and SARS-CoV-2. Also, the literature searches were restricted to publications of two years which started from December 2019 to November 2021. The ten selected publications were shortlisted related to the topic of SSNHL's link to coronavirus. It is important to note that many records were retrieved from various databases. After identification and thorough screening, ten studies were included in the review and additional studies as a point of reference (Table 1). Additionally, important data from the publication, including the purpose, country, study design, results, and conclusions of the studies, were considered.

Inclusion criteria

Only those studies were included in this review which was for the COVID-19 positive patients with changed life style was observed in them and the presence of virus has affected the hearing capability of the patients. The positivity of the COVID-19 was authenticated by polymerase chain reaction (PCR) and confirmed diagnosis of SSNHL was made in the studies.

Exclusion criteria

All those research articles were excluded from the review which was on COVID-19 positive patients but those patients do not have any symptoms of hearing loss because of presence of this virus even when the patients was confirmed to COVID-19 positive by PCR but the diagnosis of SSNHL was not confirmed, that all studies were excluded from the review.

Table 1: A review of research on the association between the occurrence of SSNHL and COVID-19.

References	Country	Study design	Purpose(s)	Main results	Conclusion
Chern et al[11]	U.S.	Clinical capsule report	To investigate hearing loss incidence in an 18-year-old COVID-19 patient	The patient presented bilateral SSNHL	COVID-19 results in otologic symptoms, including SSNHL
Fancello et al[2]	Italy	Case report	To examine the probable link between COVID-19 and SNHL	Sixty-three patients reported SNHL following COVID-19 infection	SNHL is significantly linked to COVID-19, even though more extensive research should exist
Jeong et al[3]	Korea	Case report	To examine the effects of COVID-19 vaccination on hearing loss in a 61-year-old woman	Three months after vaccination, the patient experienced SSNHL	COVID-19 vaccine affects patients with the virus, causing SSNHL
Meng et al[1]	China	Case report	To examine the relationship between SSNHL and COVID-19	Out of the 23 patients, 60.9% showed symptoms of tinnitus (related to HL)	SARS-CoV-2 possesses the ability to harm the audio vestibular system, leading to SSNHL
Sriwijita-lai et al[4]	Thailand	Case report	An initial case report linking COVID-19 to hearing loss	There is neurosensory hearing loss in patients with COVID-19	The authors requested more studies regarding the topic
Koumpa et al[9]	UK	Case report	To investigate the exact cause of SSNHL in a 45-	Even though there is no vivid etiology for the	Further investigation is required to ascertain the

Continued.

References	Country	Study design	Purpose(s)	Main results	Conclusion
			year-old patient with COVID-19	SSNHL in the patient, it can be associated with COVID-19	relationship between the cause of SSNHL and COVID-19 infection
Fidan et al[8]	US	Retrosp-ective study	Measuring the prevalence of SSNHL clinical features in otolaryngology clinics (OC) during the COVID-19 epidemic	Patients' numbers suffering from SSNHL increased spontaneously from 2019 through 2020	COVID-19 is a significant contributor to SSNHL
Rahimi et al[10]	UK	Case report	Relating COVID-19 infection to SSNHL in a 60-year-old patient	Sudden loss of hearing was confirmed to be associated with coronavirus infection after testing the patient, who turned out positive for the virus	The case report confirms that SSNHL can be related to COVID-19
Gerstac-ker et al[6]	Germany	Case report	To investigate if COVID-19 is directly connected to sudden bilateral deafness in a 38-year-old patient	Acute deafness was prominent in the left ear, while HL was recorded in the right ear	SARS-CoV-2 causes acute damage to the auditory system
Edwards et al[2]	UK	Case report	To investigate the exact cause of SSNHL in a 68-year-old patient with COVID-19	A pure tone audiometry test indicated that the patient suffered severe SNHL in both ears	There is a shred of increasing evidence associating SSNL with COVID-19

RESULTS

Eventually, the systematic review incorporated 9 case studies and one retrospective study from various authors. All the publications had a robust view that COVID-19 is a significant cause of SSNHL in patients. The nine case studies included 84 patients who underwent various testing, including Pure-tone average tests to ascertain hearing loss in coronavirus patients. It is vital to note that the research outcome did not investigate the treatment of SSNHL or COVID-19. The prospective study compared the increase of SSNHL incidence at the start of COVID-19, from December 2019 to December 2021.

In the nine case studies, including 84 patients, the hearing loss degree was measured as mild, mild-moderate, moderate, moderate-severe, severe, severe-profound, and profound.

Table 2: Hearing loss severity in the patients included in the literature study.

SSNHL degree	Number of patients	Percentage
Mild	9	11
Mild-moderate	15	18
Moderate	4	5
Moderate-severe	8	9
Severe	6	7
Severe-profound	30	36
Profound	12	14

DISCUSSION

The main objective of this systematic review was to find a link between coronavirus and sudden sensorineural hearing loss. All the patients in the literature reviewed were adults; there are no reported cases of SSNHL in children with Coronavirus. In some cases, tinnitus which is mainly related to sensorineural disorders was observed in patients with SSNHL; also, in some cases, after undergoing pure tone audiometry, hearing loss was unilateral or bilateral.[5]

Sriwijitalai and Wiwanitkit were the first researchers to mention if there was a good relationship between the two. Sriwijitalai and Wiwanitkit's report indicates that a woman experienced SSNHL after suffering COVID-19. Besides, Fancello et al affirmed that viruses are more prone to affect the inner ear (semicircular canals and cochlea), and COVID-19 being a virus, has high potential to cause hearing loss within ten days to two months of infection.[2,3,6] "The high rate of chemosensory impairment in COVID-19 patients endorses the neuro-invasiveness features of SARS-CoV-2, and the olfactory nerve may represent the virus entry point to the central nervous system".[2] Table 2 represent the total number of case studies reported on patients with COVID-19-SSNHL related. The patients are sampled across the literature under review. The two observations indicate a more robust correlation between COVID-19 infection and the clinical presentation of SSNHL. In most patients, 30 out of the 84 showed some severe-profound symptoms of SSNHL.[6.]

A more intriguing publication is Fidan et al retrospective study. The research measured the incidence of SSNHL-COVID related from December 2019 to September 2020.[6-8] The findings indicate that in 2019 there were four cases reported of SSNHL related to COVID-19.[9] This is an indication that the p-value is less than 0.001; there is a chance that there could be one person having SNNL-COVID-19 described in a thousand people.[10] Additionally, in September 2020, Fidan et al reported that 68 patients were admitted to the otolaryngology clinic with SSNHL manifestations.[8,11] Generally, after going through this literature and the observations, I can assume that COVID-19 infection predisposes to sudden sensorineural loss.[12]

CONCLUSION

SARS-CoV-2 possesses the propensity to produce significant audio vestibular impairment, culminating in SSNHL. Unfortunately, the precise SARS-CoV-2 action on the audio-vestibular pathway is yet unknown. Most research articles published give insufficient data and do not accurately give the prevalence of the SSNHL worldwide. Ass several authors mentioned, there should be intense and extensive research on how COVID-19 relates to hearing loss.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Hussain T, Ghaznain A, Patil N. COVID-19 and sensorineural deafness: systemic review. Int J Community Med Public Health 2022;9:3845-8.