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Prevalence of Otorhinolaryngology Manifestations in COVID-19 Patients

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ABSTRACT

Background: As COVID19 is a pandemic disease with a variety of symptoms. It was a must to study these symptoms focusing on ENT symptoms both during the illness and post recovery.

Objective: This study aimed to evaluate the prevalence of otolaryngological manifestations in COVID-19 patients.

Methods: A non-random cross sectional observational study included 18 patients had COVID-19. They underwent otorhinolaryngology examination. Subjective methods were used for smell and taste and audiovestibular evaluation. PTA was performed in all frequencies to determine the type and level of hearing impairment.VNG was done to detect vestibular insults if present.

Results: The sample collected showed that 14 (77.7%) patients felt dizzy. Regarding smell affection, 11(61.1%) patients had smell affection of varying degrees. Sore throat and dysphagia were reported in 55.5% of patients. Dysphonia was in 6 (33.3%). Also, generalized symptoms were present in 13 (72.3%). Tinnitus only was present in 7 patients (38.9%) with 57.2% of them had normal hearing level, while the rest (42.8%) had hearing loss. As regards PTA findings, hearing impairment was bilateral in 16.66%, unilateral in 22.2% and normal hearing was noted in 61% of cases. VNG revealed central affection in 2 patients (11.1%) only.

Conclusion: Audiovestibular system can be affected by SARS-COV-2 resulting in sudden sensorineural hearing loss (SSNHL) and dizziness. No systematic research was done, so the real prevalence of COVID-19 related SSNHL and dizziness around the world is unknown. Further research needs to be done.

Keywords: COVID-19, PTA, SNHL, Dysgeusia.

INTRODUCTION

COVID19 is an infectious respiratory disease caused by a novel virus, corona virus[1]. Symptoms of COVID-19 range from a symptomatic carrier to severe viral pneumonia [2]. Dry cough, lack of appetite, diarrhea, myalgia, fever, headache and asthenia are the most prevalent generalized manifestations [3]. The ORL manifestations include nasal congestion, hyposmia, dysgeusia, rhinitis, epistaxis, pharyngitis, otitis externa, dizziness and tinnitus[4]. Eustachian tube dysfunction because of nose and nasopharynx infection leads to fullness of the ear, otalgia and hearing loss [5].

A sudden olfactory dysfunction (OD) is a common symptom of COVID-19. it may be isolated or associated with other symptoms [6]. It is possible that SARS-CoV-2 targets both gustatory and olfactory systems [7]. A specific diagnostic tool for COVID-19 in developing countries currently affected by the pandemic is anosmia [8].

Dysgeusia is the term of taste disturbance and is one of the symptoms of Covid-19 [9]. Taste alteration differs from patient to another, some experience the alteration as feelings like bitterness and the others experience different tastes even without external stimuli to the tongue [10].

A rare presentation of COVID-19 disease noted in some literature over the past one-year post COVID outbreak is hearing deterioration [11]. Because the virus creates a negative impact on an individual's hearing capability [12]. A hearing decline of at least thirty dB in at least three consecutive frequencies that has developed within three days is referred as SSNHL [13]. With a frequency of 5–160 cases per 100 000 subjects per year all over the world [14]. The cause of hearing deterioration is not confirmed in many cases and variable pathologies are attributed as viral related, vascular occlusion and immune mediated or cellular stress response [15]. Cytomegalovirus and herpes species cause hearing deterioration, although they are rare causes of SSNHL [16]. The novel SARS-CoV-2 infected over 0.5 million subjects and caused a variety of recorded manifestations. A large percentage of the patients seen are without symptoms (20–86% of recorded cases) or have mild undocumented manifestations [17]. Nerve inflammation in COVID-19 in the form of disturbed smell was documented, but the relationship between COVID-19 and sensorineural hearing disorders is not explored till now. Labyrinthitis or neuritis which causes symptoms like tinnitus, vertigo and hearing impairment result from corona virus infection [18]. A virus may also lead to the formation of pro-inflammatory cytokines that result in hearing impairment [19].

The objective of the current study was to evaluate the prevalence of ENT symptoms and hearing impairment in post COVID-19 subjects. labyrinthitis or neuritis, which causes symptoms like hearing loss, vertigo and tinnitus occur due to upper respiratory tract infection resulting from corona virus.

SUBJECTS AND METHODS

This research was conducted on patients referred from ENT clinics in Menoufia. It was conducted between January 2021 and January 2022. The study group included 18 post COVID-19 subjects with no previous complain of hearing loss. They were diagnosed with positive laboratory and chest CT findings as COVID-19. They consisted of 8 males and

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10 females, with an age range of 18 to 55 years, with a mean age of 39.35 ± 9.45 years.

Exclusion criteria: Any subject with a past history of hearing affection before COVID-19 infection, past history of tinnitus, dizziness, diabetic patients, previously operated ear, patients received ototoxic drugs and rheumatological patients.

During this study, all subjects underwent detailed clinical history, full ENT examination, subjective tests to evaluate smell and taste, then referred for audiovestibular evaluation consisting of pure-tone audiometry (PTA), using the Resonance audiometer (R27A DD45 diagnostic). The PTA average for speech frequencies (0.5 to 3 kHz) was done to estimate the level of hearing impairment. Immittancemetry using Resonance r 26m. Videonystugmography (VNG) using NysStar TMDifra system.

Ethical Approval:

Before beginning the research, the study was approved by the Faculty Ethics Committee of Shebin El-Kom Teaching Hospital. A medical consent was taken from every patient. This study was designed to coincide with the Code of Ethics of the World Medical Association Ethical Approval (Declaration of Helsinki) for studies involving humans.

Statistical analysis:

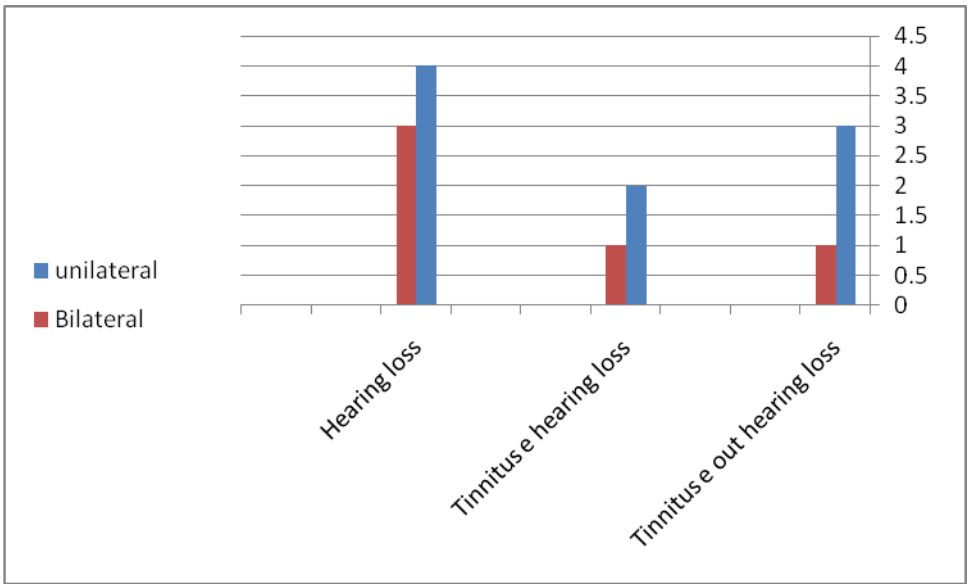
After estimating the sample size, a statistical power analysis was carried out, based on results obtained from this study (N = 18) post Covid-19 subjects. The data collected were reviewed, coded and statistically analyzed using SPSS program (statistical package of social science; SPSS Inc., Chicago, IL, USA) version 20 for Microsoft Windows. Statistical analysis was performed using two types of statistics: descriptive and analytical. A student's t test was used to test quantitative data. The Chi-square test was used for comparing categorical variables. The significance level was set at the P value ≤ of 0.5.

RESULTS

This research included 18 post COVID-19 patients, aging from 18 to 55 years with a mean age of 38.35± 10.49 and distributed as 8 (44%) males and 10 (56%) females. As regards ENT manifestations, smell affection occurred in 11 (61.1%) patients who had smell affection of varying degrees. Sore throat and dysphagia were in 55.5% of patients. Also, generalized symptoms were present in 13 (72.3%) patients as shown in table (1). Tinnitus was present in 38.9% of patients where 57.2% of them had also hearing loss and 42.2 % of them were with normal hearing (Figure 1).

Table (1): ENT manifestations in post COVID-19 patients

Ear symptoms							**Nasal symptoms**						
Hearing loss 7(38.9%)		**Tinnitus** 7 (38.9%)				**Dizziness**	**Smell affection** 11 (61.1%)			**Nasal blockage ±discharge**	**Sore throat & dysphagia**	**Dysphonia**	**General symptoms (FAHM)**
		With hearing loss ;3(42.8%)		Without hearing loss ;457.2%)			Normal	Anosmia	Hyposmia				
Unilateral	Bilateral	Unilateral	Bilateral	Unilateral	Bilateral								
4 (57%)	3 (43%)	2 (66.7%)	1 (33.3%)	3(75%)	1(25%)	14(77.7%)	2(18.2%)	6 (55.5%)	3(27.3%)	14 (77.8%)	10 (55.5%)	6 (33.3%)	13 (72.3%)



Graph (1): Graphical presentation of hearing loss and tinnitus

PTA evaluation:

Hearing impairment was bilateral in (16.7%), unilateral in (22.3 %) and normal hearing was present in (61%) of cases, so hearing impairment was estimated at 38.9% of which 41% males and 59% females. In terms of hearing impairment levels, mild degrees were estimated in 20%, moderate degrees in 30 %, moderately severe degrees in 30%, severe degrees in 20% and profound degrees in 10%. Sixty percent were high frequency sloping curves, while 40% were down sloping curves affecting all frequencies. On studying the correlation between post COVID-19 hearing impairment and subjects' age and sex, the results were insignificant for sex with a P value of 0.98, while it was significant for age with a P value of 0.04 as shown in table (2).

Table (2): Hearing loss affection in relation to personal data of the patient's

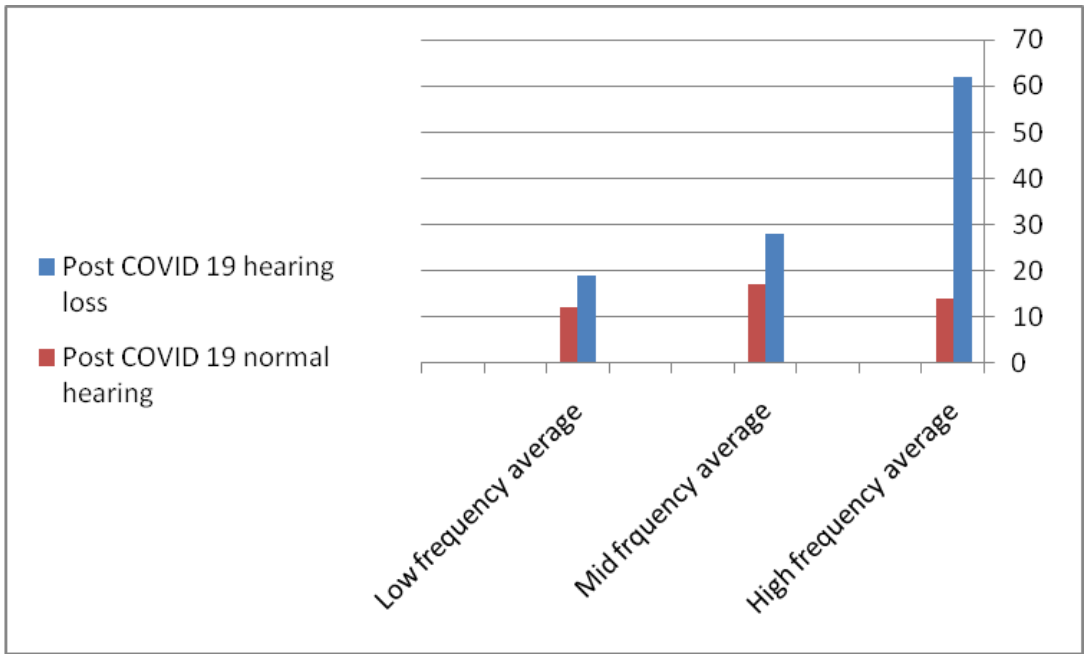
Pt. personal data	**HL**		**P value**
	Abnormal N = 7(%)	**Normal N = 11(%)**	
Age			
Mean ± SD	39.0±8.18	26.13±8.66	0.04
Range	28 – 55	18-34	
Sex			
Male	3 (43)	5 (45)	0.98
Female	4 (57)	6 (55)	

X^2= Chi square test

Hearing loss was significant as regards the age and insignificant as regards the sex. Regarding PTA configuration, there was a significant difference between patients with hearing loss and normal patients in high frequency pure tone average, as seen in table (3) and figure (2).

Table (3): PTA average between covid-19 patients with hearing loss and COVID 19 patients with normal hearing.

PTA average	**COVID-19 with hearing loss N = 10 ears**	**COVID-19 with normal hearing N = 26 ears**	**P value**
Low frequency average			
Mean ± SD	19±0.34	12±0.27	**0.98**
Range	15 – 30	10 – 20	
Mid frequency average			
Mean ±S D	28±0.46	17±0.24	**0.09**
Range	15 – 45	15 – 20	
High frequency average			
Mean ±SD	62±0.39	14±0.29	**<0.001**
Range	35 – 90	10 – 25	



Graph (2): Graphical presentation of PTA average between post COVID-19 patients who had hearing loss and patients with normal hearing.

VNG results

As regarding VNG results, no finding can be detected in 89.9% of cases with 11.1% positive findings detected in the form of abnormalities in spontaneous nystagmus, smooth pursuit and saccades as shown in table (4). While the rest of the test results of oculomotor as well as positional, positioning and caloric irrigation were free.

Table (4): VNG (Oculomotor test) results in post COVID-19 cases

Oculomotor tests			Mean ± SD (Range)
Spontaneous nstagmus	With fixation		18(100%)
	Without fixation		2 (11.1%)
Gaze nystagmus	With fixation	Rt.	18(100%)
		Lt	18(100%)
	Without fixation	Rt.	18(100%)
		Lt	18(100%)
Saccade	Latency	Rt.	154.3± 16.2 (118-206)
		Lt	139.6± 11.5(114-200)
	velocity	Rt.	296.1± 24.4 (251-362)
		Lt	289.4± 22.2(230-322)
	accuracy	Rt.	83.2± 4.7 (75-101)
		Lt.	92.1± 6.0 (83-109)
	Abnormal		2(11.1%)
Smooth pursuit	Gain low frequency		95.1± 3.01(82-101)
	Gain high frequency		96.7± 8.2(84-113)
	Positive saccades		2(11.1%)
Optokinetic	Rt. beating gain		93.7± 4.9(80-101)
	Lt beating gain		91.8± 6.1(83-100)
	Total		18(100%)

DISCUSSION

COVID-19 not only a respiratory disease but also affects the major organs and systems in the body such as the vascular system. Vascular effects are caused by damage to the blood vessels and or formation of micro emboli (tiny clots) that interrupt the blood flow. If the artery of the inner ear is damaged or blocked, it can affect both the cochlea and the vestibular organs responsible for balance [20].

18 patients with COVID-19 included in this research were adults. 38.9% of patients had hearing disorders. The percentage of affection was 41% for males and 59% for females. Tinnitus is one of the most typical sensorineural disorders and in 38.9% of patients it co-exists with hearing disorders. In this research, we discovered that 42.8% of patients with COVID-19-related SNHL had tinnitus symptoms similar to the presentation of regular SNHL. In VNG 11.1% of cases had positive central findings. Smell dysfunction in COVID-19 patients was explained by some hypotheses: the first of them is nasal congestion, obstruction and rhinorrhea. The second is loss of the olfactory receptor neurons. The third is brain infiltration affecting olfactory centers and the last is due to damage of the supporting cells in the olfactory epithelium [21].

Dizziness is a prevalent feature of covid-19 infection. It is usually present early after infection. Vestibular system affection presented as an attack of sudden onset and is often within the first week [22]. Vertigo and other types of dizziness can arise from a variety of reasons without necessarily affecting the vestibular system [23]. Since the infection affects the central nervous system; neurological symptoms may manifest both early and during the drawn–out recovery process. Dizziness is one of among neurological complications [24]. Dizziness cause was explained with some hypothesis. One theory puts out the idea that the virus directly involves the inner ear and vestibular nerve structures and unites with the receptors found in the Eustachian tube, middle ear mucosal epithelium and inner ear. This would then influence the vestibular nerve resulting in vertigo. Another hypothesis assumed that the virus causes an inflammation of the inner ear vessels that cause vasculitis then dizziness [25].

In some studies; COVID-19 related SSNHL is either unilateral or bilateral however unilateral loss is the most common [26]. In comparison with the general population, COVID-19 patients had considerably greater likelihood of binaural morbidity in SSNHL. **Shah *et al.*** [27] looked at SSNHL patients with COVID-19 who were referred to their otolaryngology clinic. Three of them experienced symptoms on both sides. The fact that ototoxicity symmetrically affects both ears have something to do with it [28]. Despite that many COVID-19 manifestations were documented, there is still a dearth of information regarding the connection shortage of recording between COVID-19 and hearing. Tinnitus and hearing loss are symptoms that have been reported in instances of COVID-19 and influenza viruses, although they haven't received much research [29].

Research on steroid delivery as a potential treatment for sensorineural hearing loss is still ongoing [16, 17, 28, 30 ,31]. SARS-CoV-2 was discovered in patients with sensorineural hearing loss who visited the otolaryngology clinic. **Kilic *et al.*** [29] utilized a polymerase chain reaction (PCR) assay on 5 cases with SSNHL. The SARS- CoV-2 PCR assay`s sensitivity differs significantly among them. A recent evaluation of the patient`s case reported sensitivity varying from 32% to 98% based on the sample site as well as quality, viral clearance and multiplication [32]. Last but not least, **Mustafa** [17] estimated the transient evoked otoacoustic emissions (TEOAE) of 20 asymptomatic COVID 19 patients who tested positive for SARS COVID-19 and 20 control patients. Concluding that; SARS-CoV-2 positive patients had significantly worse high frequency PTA thresholds and TEOAE amplitudes. This clarifies that there is a strong relation between cochlear disorders and COVID-19. Affection of the organ of corti in patients with SSNHL is in the form of loss of either supporting cells or hair cells without inflammatory cell infiltrate, suggesting that idiopathic SSNHL pathology is usually linked to cellular stress pathways [33]. The mechanism of SARS-CoV-2 affection is by binding to the ACE-2 receptor, which is found on the endothelial cells and alveolar epithelial cells. Also, it was detected in the stria vascularis and spiral ganglion, as well as epithelial cells of the middle ear in mice [34]. Furthermore, SARS-CoV-2 results in an inflammatory reaction and an elevation in cytokines such as interleukin1and 6 and tumor necrosis factor-α [12].

CONCLUSION

It was found that there was a relationship between SARS-CoV–2 and SSNHL as a result of the audio–vestibular system injury. The precise process by which SARS-CoV-2 affects the audio-vestibular system still not well understood. To fully understand the global prevalence of SSNHL in COVID-19 patients more investigations are required.

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