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Original articles

Post-COVID-19 syndrome: An investigation of speech-language-hearing symptoms

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ABSTRACT

Purpose: to investigate speech-language-hearing symptoms in adults after the acute phase of COVID-19 and the impact of these persistent symptoms on their physical and emotional aspects, functional capacity, and social relationships.

Methods: 204 adults who tested positive for COVID-19 between January 2021 and July 2022 and who completed an online questionnaire, addressing different variables. Data were analyzed with descriptive statistics.

Results: the most prevalent symptoms up to 30 days after infection were tiredness (46%), memory loss (40.2%), and ageusia (26.5%). The most found long-term symptoms were memory loss (34.3%), tiredness (21.1%), and difficulties in starting a sentence or conversation (10.1%). Anosmia and ageusia were also cited. These persistent symptoms had an impact on their emotional aspect (33.3%), followed by the physical (26%) and occupational (25%) ones.

Conclusion: this study found persistent symptoms after the acute phase of COVID-19, which can lead to speech-language-hearing disorders, such as impaired oral language and eating. These persistent symptoms impacted the participants' emotional, physical, and occupational aspects.

Keywords: Post-Acute COVID-19 Syndrome; Diagnosis; Speech, Language and Hearing Sciences

A study conducted at the Universidade de Sorocaba, Sorocaba, São Paulo, Brazil.

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INTRODUCTION

COVID-19 belongs to the Coronaviridae family caused by the SARS-Cov-2 virus and is an acute respiratory infection transmitted by respiratory droplets and contact. The first records occurred in December 2019 in the city of Wuhan, China, spreading rapidly in 2020, thus, causing a global pandemic[1].

This infection encompassed asymptomatic cases and clinical manifestations classified as mild, moderate, severe, and critical. Some of the symptoms generally include cough, sore throat, nasal congestion, runny nose, loss of smell (anosmia) and taste (ageusia), fever, muscle pain, fatigue, headache, conjunctivitis, diarrhea, nausea, vomiting, decreased appetite, dyspnea, chest pain, and shortness of breath on slight exertion. Oxygen saturation less than 95% in room air, pneumonia, skin rash, discoloration of fingers or toes, and multiple organ dysfunction may also occur. Such symptoms can appear 2 to 14 days after exposure to the virus[2]. However, patients who have been affected by COVID-19 may remain with symptoms even after the acute phase of the disease has resolved.

Medical-scientific communities and organizations have recognized the terms post-COVID-19 syndrome, long COVID, and post-acute sequelae of COVID-19 because of the considerable increase in people whose symptoms persist after being infected with the virus. Long COVID-19 is described as the presence of at least one persistent symptom, which includes fatigue or dyspnea for at least 3 months after symptom onset, hospital admission, or diagnosis [3].

Although their causes are still unknown and their terminologies diverge, some studies have recommended the use of the terms post-acute sequelae of COVID-19 (considering symptoms that persist 4 to 12 weeks after the acute phase of the disease) and post-COVID-19 syndrome (considering symptoms that persist for more than 12 weeks)[4,5].

Speech-language-hearing (SLH) therapy intervention for COVID-19 patients in intensive care units has been widely reported, mainly due to prolonged intubation and mechanical ventilation, which pose a high risk of swallowing and voice changes[6]. However, little is known about long-term or new SLH symptoms that emerge after infection with the virus. SLH therapy can help treat acquired sequelae and recover aspects specifically addressed by SLH pathologists. Hence, such patients may need rehabilitation and monitoring programs.

Given that SLH therapy is a science that evaluates and rehabilitates individuals with language, voice, speech, hearing, and swallowing changes and that little is known about the highly incident post-COVID-19 syndrome, this study aimed to investigate the presence of SLH symptoms in adults after the acute phase of COVID-19 and the impact of the persisting symptoms on physical and emotional aspects, functional capacity, and social relationships. Despite the few such studies in the national and international literature, the hypothesis is that individuals with post-COVID-19 syndrome may have their language, voice, hearing, and/or swallowing functions impaired.

METHODS

This study was approved by the Research Ethics Committee (CEP) of the University of Sorocaba, Brazil, under evaluation report number 5,958,717 (CAAE 66902623.5.0000.5500). Participants who agreed to participate signed a digital informed consent form and were invited to fill out a form via Google Forms, with 16 investigative multiple-choice questions on the topic developed by the authors.

The questionnaire obtained data on the participants' sex, age, date of COVID-19 infection, number of times they contracted the virus, history of comorbidities prior to COVID-19 infection (diabetes, heart disease, asthma, cancer, high blood pressure), severity of the disease (need for hospitalization, oxygen supplementation, or orotracheal intubation), duration of symptoms after contracting the disease (lasting up to 4 weeks [short term], 4 to 12 weeks [medium term], or more than 12 weeks, even up to the present day [long term], vaccination status, type and frequency of SLH or general symptoms that might impair language, speech, voice, hearing, and swallowing functions (e.g., dysphonia, dyspnea, fatigue, sore throat, dysphagia, decreased appetite, anosmia [loss of smell], ageusia [loss of taste], hearing loss, tinnitus, anomia, and memory impairment). The questionnaire also investigated the impact of persistent symptoms on physical and emotional aspects, functional capacity, and social relationships.

The sample had 204 participants – 163 women (80%) and 41 men (20%) –, aged 18 to 60 years (mean of 35 years), diagnosed with COVID-19 through

laboratory (RT-PCR) or rapid tests between January 2021 and July 2022, regardless of their severity or need for hospitalization. People who did not completely fill out the investigative questionnaire were excluded. The results were categorized and organized in an Excel® table for analysis using descriptive statistics (absolute and relative frequency).

RESULTS

Characterization of the sample

Most participants had no history of comorbidities prior to COVID-19 infection. The most prevalent comorbidity was obesity, followed by hypertension and asthma (Figure 1). Also, only three participants in the sample had not been vaccinated against COVID-19.

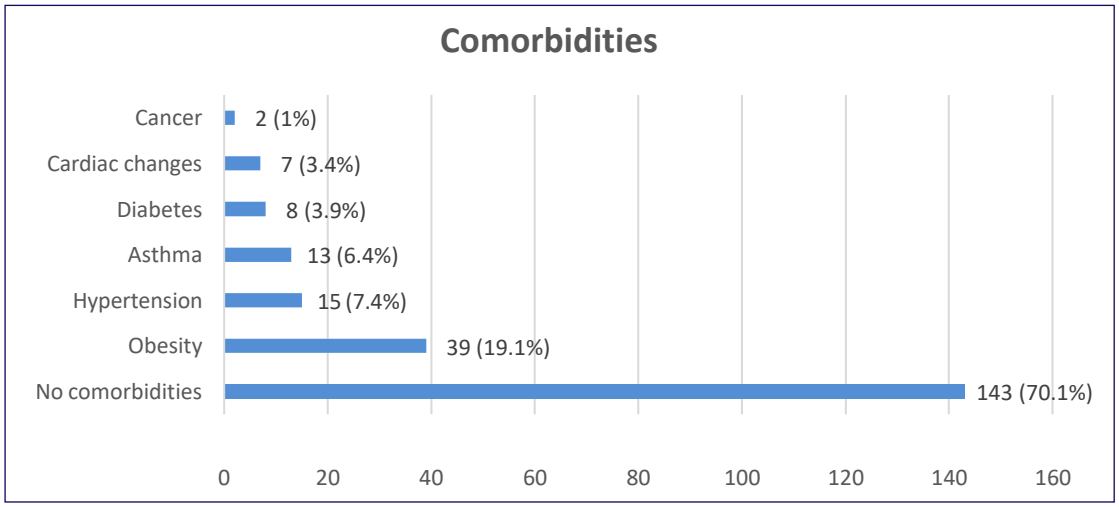

Figure 1. Occurrence of comorbidities among participants

Most participants had been infected with COVID-19 only once (Figure 2). The disease was confirmed mostly (75.5%) through laboratory tests (RT-PCR), whereas the other ones were confirmed through rapid tests (24.5%).

Six people needed hospitalization due to COVID-19. Among them, four required oxygen therapy or underwent orotracheal intubation during hospitalization – i.e., they had the most severe form of the disease.

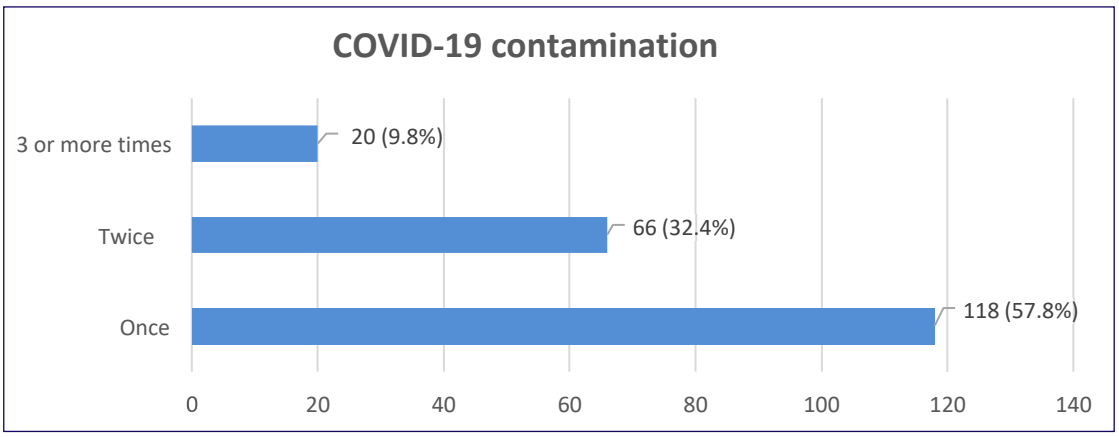

Figure 2. Frequency of COVID-19 contamination

Type and frequency of symptoms

Complaints of tiredness predominated among the symptoms reported 4 weeks after the infection onset (Table 1), followed by memory impairment and changes in taste and smell. Difficult or painful swallowing was the least reported symptom. Symptoms were predominant in females, whereas 25.5% of participants did not have symptoms at this stage.

As for symptoms present 4 to 12 weeks after the infection onset, complaints of memory changes predominated, followed by tiredness and changes in taste and smell. Difficult or painful swallowing was again the least reported symptom in this period. Symptoms were predominant in females. The number of participants without symptoms was greater than in the previous phase of the disease. These data are shown in Table 2.

Table 1. Type and frequency of symptoms reported 4 weeks after the acute phase of COVID-19

SYMPTOMS	Total number of cases	Percentage
Hoarse or weak voice	17	8.3
Sore throat	14	6.9
Difficult or painful swallowing	3	1.5
Cough and/or choke with saliva or food	26	12.7
Decreased appetite	19	9.3
Taste changes	54	26.5
Smell changes	48	23.5
Shortness of breath	28	13.7
Tiredness	87	42.6
Memory impairment	82	40.2
Difficulty starting a conversation	26	12.7
Tinnitus	10	4.9
Hearing loss	5	2.5
No symptoms	52	25.5

Table 2. Type and frequency of symptoms reported 4 to 12 weeks after the acute phase of COVID-19

SYMPTOMS	Total number of cases	Percentage
Hoarse or weak voice	13	6.4
Sore throat	6	2.9
Difficult or painful swallowing	1	0.5
Cough and/or choke with saliva or food	9	4.4
Decreased appetite	7	3.4
Taste changes	29	14.2
Smell changes	28	13.7
Shortness of breath	16	7.8
Tiredness	67	32.8
Memory impairment	80	39.2
Difficulty starting a conversation	24	11.8
Tinnitus	12	5.9
Hearing loss	4	2.0
No symptoms	73	35.8

The persistence of symptoms for more than 12 weeks (Figure 3) and up to the present day (Figure 4) was similar, with a predominance of memory changes, followed by tiredness and difficulty in starting a conversation. Changes in taste and smell were also mentioned. There was again a predominance of symptoms in females (55%).

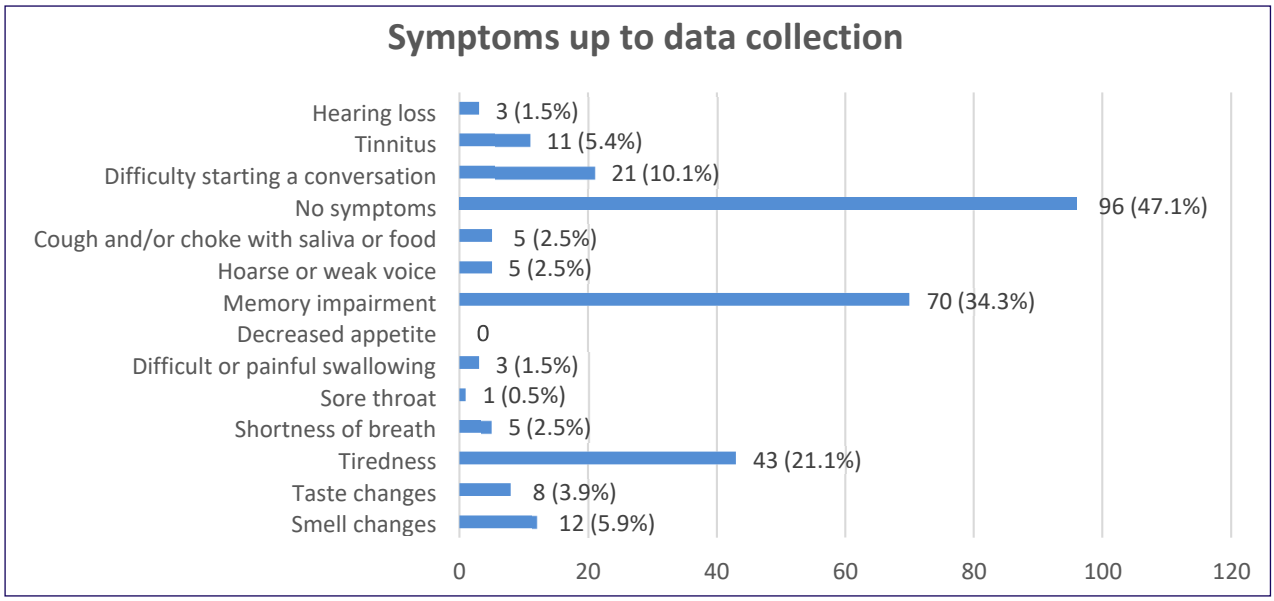

Figure 3. Type and frequency of symptoms reported as lasting more than 12 weeks after the acute phase of COVID-19

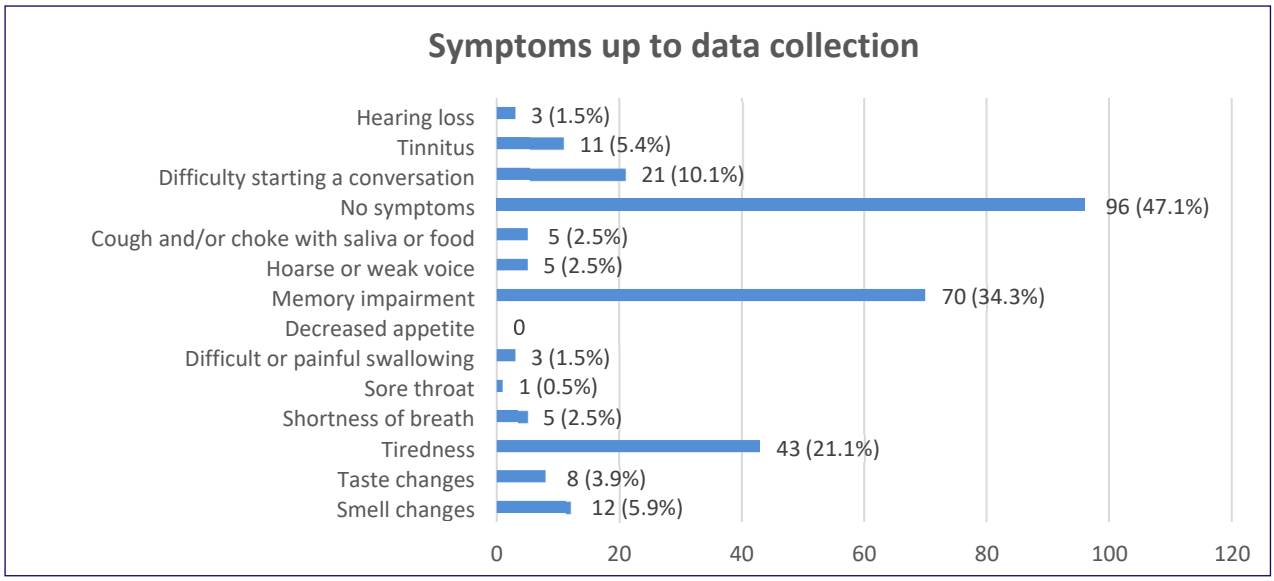

Figure 4. Type and frequency of symptoms reported as lasting up to the time of data collection

The persistence of symptoms, as reported by 126 participants (61.8%), had an impact on their quality of life after COVID-19 infection. The greatest impact was in the emotional/psychological domain, followed by the physical domains and occupational capabilities (Figure 5).

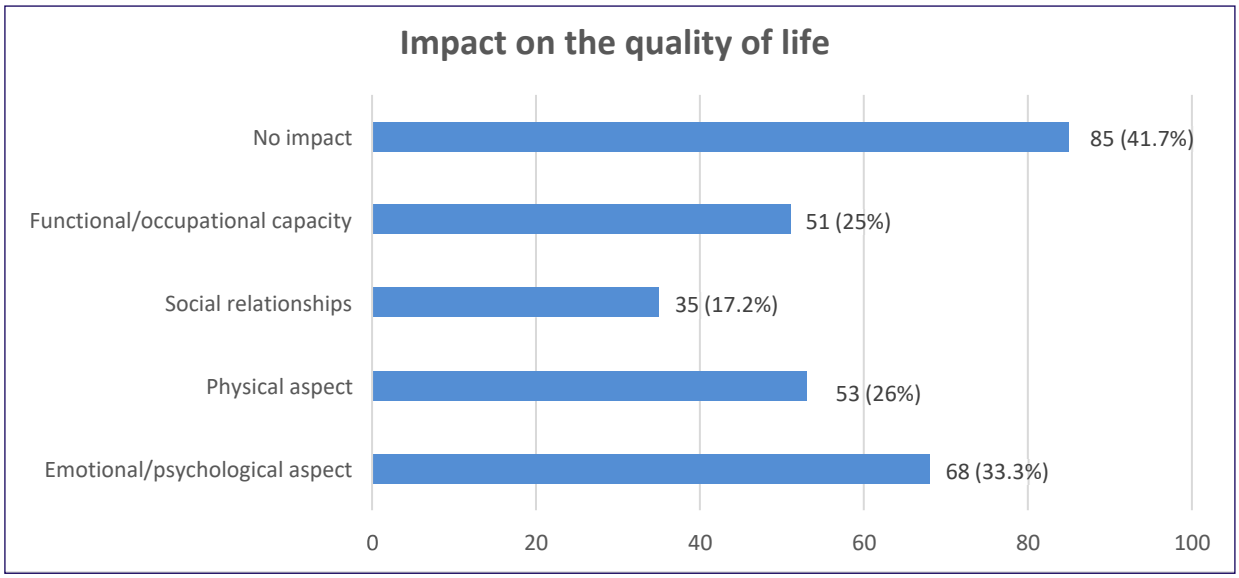

Figure 5. Impact of persistent COVID-19 symptoms on the quality of life

DISCUSSION

This study found a prevalence of symptoms shortly after the end of the acute phase of COVID-19 and until the present day, such as tiredness and changes in memory, taste, and smell.

Smell and taste disorders are related to a wide range of viral infections. Upper respiratory tract infection can cause acute anosmia or ageusia onset, due to viral damage to the olfactory epithelium and possible damage to the olfactory nerve or bulb – although the pathogenesis is not yet completely understood[7,8].

Smell and taste dysfunction was found in 53% of COVID-19 patients in a study in 105 such individuals 4 and 12 weeks after infection. Even though many patients appear to recover their taste and smell within a few weeks, it has been reported that most of them did not recover these functions[8]. In another study in 125 patients with taste and smell changes in the acute phase of COVID-19, 30 (24.0%) of them reported persistent changes in taste and smell 7 months after the symptom onset.

Female patients were more likely to report persistent symptoms than male ones[9], which corroborates the present results.

Symptoms of dysphagia and loss of appetite were rarely reported in this study at any stage after the acute phase of the disease. Nevertheless, sensory information is knowingly important for safe and efficient swallowing[10]. Furthermore, changes in taste and smell can lead to a lack of appetite associated with reduced eating pleasure, with consequent weight loss and malnutrition, reducing these patients' quality of life[7,8].

Shortness of breath, muscle weakness, and psychological distress are among the symptoms most reported by patients hospitalized with COVID-19 after discharge[11-13]. Fatigue is also one of the most reported symptoms during and after COVID-19 infection, possibly due to excessive respiratory effort related to respiratory complications such as dyspnea, pneumonia, and acute respiratory distress syndrome[14]. Also, the high catabolic response to COVID-19 infection, leading to weight loss and muscle decline, may further contribute to the manifestation of fatigue[15].

In this study, tiredness or fatigue was the most reported symptom in the short term (4 weeks after infection), also persisting over time (i.e., until the present day). Despite not being so prevalent among the permanent symptoms reported, fatigue is known to interfere with voice production, voice quality, and swallowing/breathing coordination – which is an important mechanism for protecting the lower airway[10].

Dysphagia may occur in this group of patients as a consequence of either primary damage to the central and peripheral neural network related to swallowing or the often longer intensive treatment and ventilation. Early clinical findings showed persistent dysphagia as part of post-COVID-19 syndrome, so patients also need long-term measures to rehabilitate safe and sufficient oral food intake[16]. This information does not corroborate the data found in the present study, since only eight patients had symptoms of dysphagia after 3 months of infection. It is important to highlight that only one of the six patients who had been hospitalized reported long-term changes in swallowing.

Memory impairment and difficulties in starting a sentence or conversation are two very relevant short-, medium-, and especially long-term symptoms found in this study.

Brain fog is a term that refers to a set of neurological symptoms related to COVID-19, caused mainly by the inflammatory cytokine storm found in the body during infection. Thus, though the lungs are the first site of infection, the virus also has neurotropism and can infect cortical and hypothalamic regions, causing short and long-term memory loss in many patients[17]. It may manifest in everyday situations, such as forgetting simple tasks or having difficulty remembering words or phrases. This can also be justified by the chronic stress as a protection for the brain, which consequently fatigues the hippocampus and generates cell death in important brain regions[18]. Furthermore, it may have a psychological/psychiatric origin, since patients who survived other coronavirus infections were more prone to posttraumatic stress disorder[19].

As for the impact on quality of life, most participants report impairment in the emotional aspect, followed by physical and functional aspects. A study evaluated the impact of post-COVID on the quality of life of 221 participants and likewise found greater damage in psychological and physical aspects[20].

In cases of post-COVID-19 syndrome, SLH therapy can act, if present, on muscle weakness to address changes in breathing, voice, speech, mastication, and swallowing; loss of taste and smell, which can cause a lack of appetite and difficulties in eating; communication disorders due to memory changes and difficulty concentrating (worsening speech understanding and expression); respiratory difficulties such as chronic cough, causing vocal changes and speech-breathing disorders; and dysphagia, which causes choking[21].

Given the SLH manifestations found in individuals after the acute phase of COVID-19 contamination, their long-term symptoms must be monitored to carry out relevant interventions. Also, further studies must address this topic and consider monitoring and rehabilitation programs for this population.

CONCLUSION

The most common symptoms of post-COVID-19 syndrome were memory changes, tiredness, and difficulties in starting a sentence or conversation. Changes in taste and smell were also persistent. Such symptoms can impair oral language and eating in individuals after the acute phase of the disease. Such persistent symptoms impacted the participants' emotional, physical, and occupational aspects.

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Authors' contributions:

ACMF: study conceptualization, data collection and analysis, and article writing;

MFA: data analysis and article writing;

CMS: all research stages as the main research supervisor.