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Original articles

Aspects of general, mental, and auditory health among nursing team members of a public hospital affected by Covid-19

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ABSTRACT

Purpose: to analyze possible impacts on the general, mental and hearing health of nursing workers affected by the COVID-19 virus.

Methods: an exploratory, cross-sectional study, carried out with nursing professionals from a public hospital in Southern Brazil, who answered a questionnaire on general and auditory symptoms after COVID-19 infection, and the Oldenburg *Burnout* Inventory (OLBI). Statistical analysis was performed using the Chi-square test of independence, the ANOVA test with Tukey's post-test and Pearson's Linear Correlation, with a p-value of 5%.

Results: 52 workers participated (17 nurses, 30 technicians, five aides). The symptoms of headache, loss of smell and taste, fatigue and muscle pain were reported by more than 75% of workers; 80.8% either had already been classified as *burnout* (40.4%) or featured high scores for exhaustion or work disengagement (40.4%), with a correlation with the symptoms of cough (p=0.0327) and fever (p=0.0235); 44.23% had auditory symptoms, with dizziness/vertigo reported by 34.6% and tinnitus by 13.5%, although without correlation with *burnout* levels (p=0.4250).

Conclusion: there were impacts on the general, mental and hearing health of nursing workers who were diagnosed with COVID-19, mainly cough and fever, *burnout*, tinnitus and dizziness.

Keywords: COVID-19; Occupational Health; Signs and Symptoms; Hearing; Tinnitus; Dizziness

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INTRODUCTION

In the province of Wuhan (China), December 2019, the first case of severe acute respiratory syndrome – caused by a new coronavirus 2 (SARS-COV-2)[1] – broke out. Later, the disease was named COVID-19 (Coronavirus Disease 2019) by the World Health Organization (WHO), and on March 11, 2020, the WHO classified that disease as a pandemic, due to its fast pace and widespread transmission, reaching 114 countries until then[2].

Patients infected with COVID-19 frequently report subjective neurological symptoms manifested from the early phases of the disease, such as taste, smell and hearing disorders, which can be explained by the probably intrinsic neurotropic properties of such disease, leading to the need of a broad investigation of the infection consequences in the central nervous system[3].

Smell and taste disorder is reported by most patients diagnosed with COVID-19[4-6]. Thus, those symptoms may help in the triage of infected individuals, and may be an effective strategy to interrupt its transmission on the onset of the disease[4].

Despite the lower incidence of this symptom, hearing disorder is also related to the diagnosis of the COVID-19. In an integrative review, the authors concluded that the virus of the COVID-19 has deleterious effects on hearing as well as on the quality of life of the infected people, and they suggested that further studies should be held for new findings[7].

As the pandemic aggravated, healthcare system and hospitals had to face an astonishing demand of patients with respiratory infection due to the severity of the symptoms caused by COVID-19.

Pandemics demand health professionals to endure an overload of work under stressing conditions in unknown, hazardous settings[8], specially on the part of nursing team members, who play an important role while caring for the population, in all health care levels, whether it is a subject having the prognosis or the confirmed diagnosis of COVID-19[9].

In that context, nursing professionals became the major group prone to contamination by the COVID-19 for a number of factors, such as: initially, the absence of a vaccine against the disease, lack of health products, scarcity of personal protective equipment (PPE) and work overload[9].

Apart from the virus pathogenesis by itself, healthcare professionals underwent psychological suffering, long work shifts, burnout, fatigue and were even victims of physical and psychological abuse[10].

Nursing professionals, who are directly exposed to patients diagnosed with several diseases, sometimes unknown ones, such as COVID-19, associated with excessive workload, scarce time for recovery, resource limitations, improper hospital settings, sleep disorders, may feel continuous pressure, resulting in work dissatisfaction and loss of quality in patients' health care. Moreover, physical and mental fatigue, stress, anxiety, and gradual exhaustion may lead them to the burnout syndrome[11,12].

Professionals affected by the burnout syndrome may develop mental and emotional detachment from their co-workers, patients, and even from their loved ones. The syndrome also increases the rate of health care errors, having a negative impact on patients' health[13].

In face of the new coronavirus expansion within the Brazilian territory, healthcare professionals' leading role stood out in the fight against the COVID-19 pandemic. As such professionals were in the forefront, dealing straight with the virus, they also became potential victims.

Although Science has advanced with the development of vaccines, and research studies have identified the action of the virus and its effects in the organism, further studies are still needed in order to obtain evidence on probable sequels left by the COVID-19, thus providing proper and effective treatment for them.

Therefore, the exploration of the effects of the COVID-19 may help for greater understanding of the virus action within the human organism. Consequently, the current study aimed to analyze the probable impacts on the general, mental and hearing health of nursing team members affected by the COVID-19 virus.

METHODS

It is an exploratory, quantitative, cross-sectional research study, approved by the Ethics Committee of the Clinical Hospital, Federal University of Paraná, PR, Brazil, under number 4.588.237, and Certificate of Appreciation by the National Ethics Committee (CAAE in Portuguese) number 41460720.7.0000.0096, and also approved by the Ethics Committee of the Tuiuti University of Paraná under number 4.650.079, CAAE number 41460720.7.3001.8040. The study was carried out with nursing team members, working in different sectors of a public federal hospital of the

aforementioned institution, who were diagnosed with COVID-19 between 2020 and 2021.

The following inclusion criteria were adopted for the selection of the study sampling: having been diagnosed with COVID-19 (by means of the RT-uPCR positive test or Reactive Serology); to be a nurse or nursing technician or nursing aide; age between 18 and 59 years; any gender; any hospital employment duration, and under any labor contracts; to sign the Free Informed Consent Form. As exclusion criteria, the following was considered: former hearing loss diagnosis, and/or hearing disorders prior to the COVID-19 diagnosis.

Subsequently, the nursing team members from the hospital where the study was performed, were invited to participate by means of a Whatsapp message. In it, there was information on the researcher, the study objectives and the methodology to be developed. The ones who accepted to participate received a structured electronic form in the Google Platform (*Google Forms*®), with 39 closed questions (selection box or Likert Scale), as follows: 26 questions to obtain their sociodemographic data; their general health conditions; information on their hearing health; and on their reported symptoms related to the diagnosis of COVID-19. The last 13 questions were related to the *Oldenburg Burnout Inventory (OLBI)*, created and validated by Evangelia Demerouti in Germany in 1999. It was translated, adapted and validated to Brazilian Portuguese in 2018[14].

In 2003, authors[15] proposed to measure burnout in two dimensions: Exhaustion and Disengagement from Work, being Exhaustion a consequence of the intense and prolonged physical, affective and cognitive strain due to the demand of certain jobs; and Disengagement from Work is about the detachment from work, as well as negative attitudes regarding the object, content or work in general. It comprises 13 (thirteen) questions, six of them assess exhaustion, and seven of them assess disengagement from work, whose answers are provided using the Likert Scale, ranging from 1 (one) to 4 (four), being 1 for strongly disagree; 2 for disagree; 3 for agree, and 4 for strongly agree. Authors[14] state that the OLBI is useful to measure workers' emotional exhaustion and depersonalization in the Brazilian reality. The higher the score, the higher the burnout level.

A study[16] conducted in 2008 proposed that the mean scores ≥ 2.25 in the Emotional Exhaustion (EE) dimension, and ≥ 2.1 in the Disengagement from Work (DW) dimension were considered high. Thus, individuals will be rated "with burnout" when both exhaustion and disengagement dimensions have high scores; they will be rated "disengaged" when the disengagement dimension has a high score and exhaustion has a low score; they will be considered "exhausted" when the exhaustion dimension is high and disengagement is low; and they will be rated "without burnout" when both dimensions present a low score.

The results were obtained by means of descriptive statistics, with the application of the following methods: **a**) To compare the distribution of qualitative variables, the Chi-square test of independence was applied; (**b**) To assess the difference between three or more quantitative variables, ANOVA test with Tukey's post-test was applied; (**c**) To assess the linear correspondence between quantitative variables, Pearson's Linear Correlation was applied. Alpha error was previously established in 5% for the rejection of the null hypothesis, and the statistical processing was held by means of the BioEstat programs, 5.3 version, and STATA, *release* 17.

RESULTS

During the pandemic, nursing staff comprised 1,891 professionals in the hospital, that is, 608 nurses, 888 nursing technicians, and 395 nursing aides.

Among 1,891 nursing team members, 232 were diagnosed with COVID-19 in 2021. Although all of those had been invited to participate in the research, only 63 nursing professionals accepted. After the application of the inclusion and exclusion criteria, the current study sample comprised 52 professionals, that is to say, 17 nurses, 30 nursing technicians and five nursing aides.

Among 52 nursing professionals, 75% were female (n=39), and 25% were male (n=13). Age ranged between 23 and 57 years, mean age, 39.62 years, median, 39 years, and standard deviation, 8.21 years. Length of employment ranged between one and 33 years, mean, 15.33 years, median, 15 years, and standard deviation, 7.63 years.

Subsequently, Table 1 displays the general health symptoms and the hearing symptoms reported by the participants during and after the disease.

Table 1. Characterization of the sample regarding the presence of general and hearing symptoms during and after the COVID-19 (n=52)

Symptom	During the COVID-19		After the COVID-19	
	n	%	n	%
Cephalalgia	42	80.77	11	21.15
Loss of smell/anosmia	41	78.85	12	23.07
Taste disorder/ageusia	40	76.92	9	17.30
Fatigue/astenia	40	76.92	19	36.54
Muscle pain/myalgia	40	76.92	11	21.15
Runny nose	30	57.69	0	0
Cough	25	48.08	0	0
Sore throat	25	48.08	0	0
Fever	23	44.23	0	0
Loss of appetite/hyporexia	22	42.31	0	0
Gastrointestinal disorders, such as nausea/vomit/diarrhea	19	36.54	0	0
Shortness of breath/dyspneia	16	30.77	8	15.38
Otalgia	1	1.92	0	0
Dizziness/vertigo	18	34.61	7	13.46
Tinnitus	7	13.46	3	5.77
High sensitivity to noise	4	7.69	0	0
Hearing loss	4	7.69	1	1.92
Difficulty understanding speech in talks at settings with competitive noise (for example, parties, restaurants, pubs etc.)	3	5.77	0	0
Difficulty understanding speech in talks at quiet settings	3	5.77	0	0
Difficulty memorizing important things (loss of memory)	0	0	17	32.69
Concentration deficit (difficulty keeping attention to what I am doing)	0	0	13	25.00
Mood swings. Anxiety or depression	0	0	13	25.00

Note: the participants may report more than one response in the variable: general and hearing symptoms. Captions: n = number; % = percentage.
Source: the author.

In Table 1, it can be observed that, during the COVID-19 infection, the most prevalent general symptom was cephalalgia (80.77%), and fatigue (36.54%) after the disease. The most prevalent hearing symptoms during and after the COVID-19 were dizziness/vertigo (34.61%) and (13.46%) respectively.

In addition, some symptoms emerged after the COVID-19, and the most prevalent was difficulty memorizing important things (loss of memory), reported by 17 (32.69%) professionals.

Only seven (13.46%) out of 52 professionals did not report any symptoms after the treatment for the COVID-19. Additionally, 17 nursing professionals reported that they did not need to use any medication during the infection.

During the treatment for the COVID-19, the most used medication among 35 workers was painkillers (n=25), followed by antibiotics (n=13), azithromycin was the most commonly used, and corticoids (n=13). The use of ivermectin (n=4) and hydroxychloroquine (n=1) was also reported.

Table 2 shows the rating of professionals' burnout levels, assessed by means of the Oldenburg Burnout Inventory.

Table 2. Rating of the workers' burnout levels regarding gender (n=52)

Levels of burnout	Gender				Total (n=52)		p-value
	Males (n=13)		Females (n=39)				
	n	%	n	%	n	%	
Burnout							
Present	6	46.2	15	38.5	21	40.4	0.8641
Exhaustion or Disengagement	5	38.5	16	41.0	21	40.4	
Absent	2	15.3	8	20.5	10	19.2	
Exhaustion							
High	7	53.8	15	38.5	22	42.3	0.5168
Low	6	46.2	24	61.5	30	57.7	
Disengagement							
High	10	76.9	30	76.9	40	76.9	0.9641
Low	3	23.1	9	23.1	12	23.1	

Applied Test: Chi-square of independence, significance level, 5%.
Captions: n = number; % = percentage.
Source: the author.

It is possible to observe in Table 2 that the presence of burnout is higher among males (46.2%), but there was no statistically significant difference when compared to females (p=0.8641).

Similarly, there was no statistically significant difference between the levels of burnout and age (p=0.5854), length of employment (p=0.8275), and hearing symptoms reported by the professionals (p=0.4250).

In Table 3, descriptive statistics are displayed for the levels of burnout according to the general symptoms.

Table 3. Descriptive statistics of the professionals' burnout related to the general health symptoms (n=52)

General symptoms	Absolute frequency	Relative frequency	*Mean Burnout* Score	Standard Deviation
Cough*	25	48.1	2.42	0.70
Myalgia	40	76.9	2.34	0.64
Sore throat	25	48.1	2.38	0.64
Fever*	23	44.2	2.43	0.66
Gastrointestinal disorders	19	36.5	2.35	0.68
Anosmia	41	78.8	2.36	0.66
Ageusia	40	76.9	2.39	0.63
Asthenia	40	76.9	2.37	0.65
Dyspnea	16	30.8	2.35	0.69
Hyporexia	22	42.3	2.26	0.63

p-value <0.0001*. ANOVA with Tukey's post-test.
Source: the author

Table 3 shows that cough (mean score = 2.42) and fever (mean score = 2.43) symptoms feature the highest levels of burnout when compared to the other symptoms. These significantly higher levels of burnout were found after the application of the ANOVA statistical method with Tukey's post-test, resulting in p value <0.0001.

Subsequently, Table 4 displays descriptive statistics for the Exhaustion dimension, according to the general symptoms.

Table 4. Descriptive statistics of the emotional exhaustion dimension in relation to the general symptoms (n=52)

General symptoms	N	%	Emotional Exhaustion	
			Mean score	Standard Deviation
Cough*	25	48.1	2.25	0.80
Myalgia	40	76.9	2.15	0.78
Sore throat	25	48.1	2.18	0.79
Fever	23	44.2	2.23	0.78
Gastrointestinal disorders	19	36.5	2.17	0.83
Anosmia	41	78.8	2.20	0.77
Ageusia	40	76.9	2.21	0.76
Asthenia	40	76.9	2.19	0.78
Dyspnea	16	30.8	2.20	0.87
Hyporexia	22	42.3	2.03	0.80

p-value =0.0327*. ANOVA with Tukey's post-test.
Source: the author

Table 4 shows that the only general symptom related to the Exhaustion dimension was Cough (**HIGH** Exhaustion = 2.25; p = 0.0327) when compared to the other symptoms.

In Table 5, descriptive statistics for the Disengagement dimension are presented, according to the general symptoms.

Table 5. Descriptive statistics of the job disengagement dimension in relation to the general symptoms (n=52)

General symptoms	Occurrence	%	Job Disengagement	
			Mean score	Standard Deviation
Cough	25	48.1	2.61	0.69
Myalgia	40	76.9	2.55	0.67
Sore throat	25	48.1	2.61	0.68
Fever*	23	44.2	2.67	0.67
Gastrointestinal disorders	19	36.5	2.56	0.71
Anosmia	41	78.8	2.55	0.66
Ageusia	40	76.9	2.62	0.65
Asthenia	40	76.9	2.57	0.67
Dyspnea	16	30.8	2.52	0.75
Hyporexia	22	42.3	2.53	0.69

p-value =0.0235*. ANOVA with Tukey's post-test.
Source: the author

Table 5 shows that the highest scored general symptom related to the Disengagement dimension was fever **(HIGH** Disengagement = 2.67; p=0.0235), when compared to the other symptoms.

DISCUSSION

The most prevalent symptoms reported by the nursing team members in the current study were cephalalgia, loss of the smell sense, taste disorder, fatigue and muscle pain (table 1). Several studies have reported those symptoms as the most prevalent in people affected by the COVID-19[17-26].

Caronna and Pozo[27], in a narrative review conducted in 2021 on one-year research about cephalalgia as a COVID-19 symptom, report that headache is a common symptom, one of the major complaints by patients infected with COVID-19, having a mean duration of two weeks, but it could last up to six months. According to the authors, females and young individuals seem to be more prone to headaches within the context of the COVID-19.

Algahtani et al.[19] carried out a study with 808 Saudi-Arabian patients affected by the COVID-19 in 2022, aiming at highlighting the factors associated with the persistence of anosmia and ageusia. They observed that these symptoms, chemosensitive in nature, were the most reported in the acute phase by the study participants (72% and 64.2% respectively). They persisted as the most common symptoms in the post-acute phase of the COVID-19. That percentage approaches the findings in the current research, with 78.85% and 76.92% respectively. Still regarding those authors' research[19], the persistence of anosmia and ageusia were observed to be associated with the symptom of hearing disorders and cephalalgia. In addition, they pointed out that the most significant factor associated with the occurrence and persistence of anosmia and ageusia was the gender variable. The persistence of anosmia and ageusia in females was 67% and 69.5% respectively, if compared to males (33%) and (30.5%), respectively. Other authors[22] pointed that anosmia is an early marker, useful for undergoing COVID-19 tests or self-isolation.

Two other general symptoms, highly prevalent in the current study were fatigue and muscle pain (Table 1), both reported by 76.92% of the patients, which corroborates a research study[23] from 2021 objectifying to describe the rheumatic and musculoskeletal symptoms of 300 participants, hospitalized with COVID-19, after hospital discharge. In this study, fatigue was reported by 87.3% of the patients, and myalgia by 63.3%. Additionally, it was reported that BMI increase was associated with greater chances of fatigue, myalgia and arthralgia persistence a month after hospitalization. In another study[26], conducted in 2021, sleep disorders were associated with muscle pain when this disorder was the main complaint in patients with COVID-19.

Among the hearing disorders, the most prevalent in the current study were dizziness/vertigo, followed by tinnitus, noise sensitivity, hearing loss, and difficulty understanding talks in settings with competitive noise (Table 1). Some studies have warned about the impact of COVID-19 on the auditory system, among them, authors[28] that carried out a systematic review and meta-analysis of 12 articles in 2022, which evidenced the relation between COVID-19 and hearing loss, tinnitus and dizziness. Thus, they concluded that COVID-19 may cause dizziness, tinnitus and hearing loss. However, they are cautious on the interpretation of those findings, recommending the importance of conducting well-designed studies, using objective, standardized testing.

Regarding the medication used in the COVID-19 treatment, the three most-used medicines by the nursing professionals were painkillers, followed by antibiotics (azithromycin was the most used), and corticoids. It is common knowledge that currently there has been no specific medication, available on the market, to fight the virus of COVID-19 specifically. However, in 2021, authors[29] stated that azithromycin undoubtedly had broad-spectrum in vitro antiviral properties. Additionally, azithromycin evolved consistently as a medication to fight respiratory viruses in research studies, highlighting that there have been consistent signs of its clinical efficacy in clinical studies to this moment. This medication not only evidences additional anti-inflammatory properties, but also it can be clinically significant to reduce the immunopathology in some viral diseases, mainly the pandemic betacoronaviruses.

Nevertheless, some antibiotics may present ototoxic nature, affecting hearing or vestibule. In 2011, a research study[30] released a list of commonly used medication with ototoxic effect. One of the medicines in that list is the azithromycin, which can be involved in hearing loss, may be the cause of tinnitus, dizziness or vertigo. In the face of this information, it is necessary to follow up the nursing team members who participated in the research and reported symptoms of hearing disorders.

Another medication used by the participants in the current study was corticoids. In 2022, authors[31] conducted a study with 76 subjects divided in two groups. The first group (32 subjects) had corticosteroids, and the second group (44 participants) did not take them, aiming at analyzing the impact of the

treatment with corticosteroids on the acute symptoms of the COVID-19, and on the quality of life one year after the treatment. Results suggest that the treatment with corticosteroids in hospitalized patients with COVID-19 not only improves the short-term prognosis, but also reduces the presence of symptoms, and improves the long-term quality of life. They mention that most symptoms were less frequent in the group that corticosteroids were administered, with statistically significant differences for cephalalgia, dysphagia, chest pain and depression. However, they suggest the need of further studies.

In the current study, it was observed that 40% of the sample was rated with burnout, and the other 40% of the participants had already evidenced high levels in one of the two dimensions (Exhaustion or Disengagement), which characterize burnout syndrome (table 2). This syndrome was already present in nursing professionals' daily life before the pandemics. Recent studies have addressed the impact of the COVID-19 on the strain at work[32,33].

The aforementioned research observed the prevalence of professionals prone to higher levels of Disengagement, and lower levels of Exhaustion, which corroborates another study[13], held in 2021, during COVID-19 pandemic, which aimed to determine the prevalence and degree of burnout experienced by the emergency team of two hospitals in Dublin (Ireland). Its result tended to higher levels of Exhaustion and lower levels of Job Detachment/Disengagement. This difference is believed to have relation to the choice of the cut-off point scoring. In the aforementioned study[13], the cut-off point was ≥ 1.8 in the exhaustion dimension. In the current study, the mean score was ≥ 2,25 in the exhaustion dimension. Thus, it comprised a smaller number of participants.

The current study observed that although burnout levels are higher among males (almost half of the male sample), there was no statistically significant difference when compared to the females, which means that both genders were similarly exposed to the burnout level at workplace. This result meets the observed in other studies that assessed the incidence of burnout in healthcare professionals. Similarly, in these studies, no statistically significant differences were observed in the mean levels of burnout among male and female professionals[13,34].

Another result in this study was that the level of burnout (exhaustion and disengagement dimensions) is not correlated with age. This was also observed in another study[11] conducted in 2020, which objectified to assess the level of burnout and its influencing factors in 245 nurses. They were divided in two groups, comparing nurses working at the forefront of the COVID-19 to nurses not exposed to the COVID-19. They concluded that age did not show any significant difference between both groups. Still in 2020, other authors[35] pointed that the burnout phenomenon seemed to be strongly established in the job world, affecting all ages.

The results found in the current study showed that the level of burnout does not depend on the length of employment, which suggests that less experienced professionals are more susceptible to the stressing factors at the workplace. Those aforementioned authors[35] asked the relevant question whether burnout only affects experienced workers. In another study[36], carried out in 2021, job-related stress in the nursing area is mentioned as causing trouble, mainly in the first working year, leading to greater job turnover, thus reducing employment length. Other authors[37-39] associated newly-graduated subjects to higher levels of burnout, and they more often think of quitting the nursing area.

As the study limitation, we can mention the non-adherence to the study on the part of the 232 nursing team members affected by the COVID-19. Therefore, with greater sampling, it could have been possible to find a correlation between hearing symptoms and mental health.

As it was not possible to find previous literature contemplating studies assessing burnout associated with secondary general symptoms from the last pandemic, caution is recommended to interpret those findings, and further studies, including longitudinal studies should be carried out, with greater number of participants, objectifying better understanding of hearing outcomes due to the COVID-19 and their relation to mental symptoms.

CONCLUSION

The results of the current study enable to infer that there were impacts on general, mental and hearing health of nursing team members diagnosed with COVID-19, whose main general symptoms were cephalalgia, anosmia, ageusia, asthenia and myalgia. Almost half of the participants also reported hearing symptoms, and the most prevalent were dizziness/vertigo and tinnitus.

High percentage of burnout was observed, and a high number of professionals were rated with high scores of one of the two dimensions (exhaustion or disengagement), which points to the need of emotional support and other interventions favoring those workers' mental health. However, there was no significant difference between the level of burnout and gender, age, and length of employment, suggesting that the level of stress faced by the professionals is similar.

No correlation was found between burnout levels and hearing symptoms. However, regarding the general symptoms, cough and fever, the highest levels of burnout were verified.

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Data sharing statement:

Individual data of the non-identified participants can be shared by e-mailing the mail author. However, those who use the shared data must mention the authors of this current study.