REVISTA NEUROCIÊNCIAS

Original

Incidence of clinical and neurological changes among users of post-COVID 19 primary care

Incidência de alterações clínicas e neurológicas entre usuários da atenção primária pós-COVID 19

Incidencia de alteraciones clínicas y neurológicas entre los usuarios de atención primaria después de la COVID 19

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Resumo

Introdução. A COVID-19, causada pelo novo coronavírus (SARS-CoV-2), surgiu em 2019 na China e se disseminou globalmente. A doença pode causar sintomas de gravidade variável e consequências a longo prazo, incluindo a Síndrome Pós-COVID-19 (SPC), com sequelas físicas, neurológicas e psicológicas observadas tanto na fase aguda quanto no período pós-infecção. **Objetivo.** Avaliar a incidência de alterações clínicas e neurológicas no período pós-COVID-19 entre usuários da Atenção Primária à Saúde (APS) em um município de Minas Gerais. **Método.** Trata-se de um estudo longitudinal no qual priorizou a coleta de dados por meio de um questionário, composto por onze questões elaboradas pelos pesquisadores. As perguntas foram direcionadas, inicialmente, ao período de infecção e, posteriormente, aos sintomas manifestados durante e após a doença. Foi utilizado para análise estatística o programa GraphPad Prism 8.0, teste t, considerando $p<0,05$. **Resultados.** Observou-se que os indivíduos apresentavam sequelas preocupantes mesmo após sete dias, 14 dias ou um mês após a infecção, como fadiga, perda de memória e alterações psicológicas. **Conclusão.** A partir desses resultados, identificou-se a possibilidade de traçar formas de intervenção que auxiliem na reabilitação dos indivíduos, visando à melhoria da qualidade de vida.
Unitermos. SARS-CoV-2; Síndrome de COVID-19 Pós-Aguda; Atenção Primária à Saúde

Abstract
Introduction. COVID-19, caused by the new coronavirus (SARS-CoV-2), emerged in 2019 in China and spread globally. It may cause varying symptoms of pregnancy and long-term consequences, including post-COVID-19 Syndrome (PCS), with physical, neurological and psychological consequences observed both in the acute phase and in the post-infection period. **Objective.** To evaluate the incidence of clinical and neurological alterations in the post-COVID-19 period among users of Primary Health Care (PHC) in a municipality of Minas Gerais. **Method.** This is a longitudinal study that prioritizes data collection by means of a questionnaire, composed of eleven quests prepared by researchers. The questions were addressed, initially, to the period of infection and, subsequently, to the symptoms manifested during the disease. It was used for statistical analysis or GraphPad Prism 8.0 program, t test, considering $p<0.05$. **Results.** We observed that individuals present worrying sequels even after seven days, 14 days or one month after infection, such as fatigue, memory loss and psychological alterations. **Conclusion**. Based on these results, the possibility of drawing up forms of intervention that helps in the rehabilitation of individuals, aiming at a better quality of life, is identified.
Keywords. SARS-CoV-2; Post-Acute COVID-19 Syndrome; Primary Health Care

Resumen
Introducción. COVID-19, causada por el nuevo coronavirus (SARS-CoV-2), surgió en 2019 en China y se extendió globalmente. Puede causar diversos síntomas de embarazo y consecuencias a largo plazo, incluyendo el Síndrome Post-COVID-19 (SPP), con consecuencias físicas, neurológicas y psicológicas observadas tanto en la fase aguda como en el período post-infección. **Objetivo.** Evaluar la incidencia de alteraciones clínicas y neurológicas en el período post-COVID-19 entre usuarios de Atención Primaria de Salud (APS) en un municipio de Minas Gerais. **Método.** Se trata de un estudio longitudinal que prioriza la recolección de datos por medio de un cuestionario, compuesto por once preguntas elaboradas por los investigadores. Las preguntas fueron dirigidas, inicialmente, al período de infección y, posteriormente, a los síntomas manifestados durante la enfermedad. Se utilizó para el análisis estadístico el programa GraphPad Prism 8.0, prueba t, considerando $p<0,05$. **Resultados.** Se observó que los individuos presentan secuelas preocupantes incluso después de siete días, 14 días o un mes de la infección, como fatiga, pérdida de memoria y alteraciones psicológicas. **Conclusión.** Con base en estos resultados, se identifica la posibilidad de elaborar formas de intervención que ayuden en la rehabilitación de los individuos, visando una mejor calidad de vida.
Palabras clave. SARS-CoV-2; Síndrome post-agudo COVID-19; Atención Primaria de Salud

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INTRODUCTION

Infection with the new coronavirus generates symptoms beyond the acute phase, leaving sequelae that are sometimes more intense than the signs and symptoms present at the height of the infection. The prolongation of these symptoms was named by experts as post-COVID-19 Syndrome (PCS), with the involvement of different parts of

the body, negatively impacting the individual's quality of life[1].

Complications of COVID-19 occur more frequently in individuals with pre-established risk factors, which can worsen the existing condition, in addition to causing new physiological disorders. The severe form of the infection and the prolonged period of hospitalization, especially when there is a need for mechanical ventilation, increase the probability of the emergence of PCS[2].

The sequelae after infection can occur silently and imperceptibly until it gets worse, as is the case with Acute Myocardial Infarction (AMI), or they can be perceived for months, as with the feeling of weakness, for example[3]. Studies show that there is great involvement in the cardiorespiratory system, causing a feeling of fatigue, low resistance to exercise, respiratory difficulty and other symptoms, altering functionality and bringing harm to the individual[4].

In addition to the cardiorespiratory system, there may be damage to other systems, with changes in the nervous and kidney systems, among others[5]. There is an impact that these symptoms persist among users of the health network, significantly increasing the demand for care for these sequelae, which will increase assistance and demand for more care. The challenge of the health network lies in the need to rethink strategies, to guarantee comprehensive care, promoting health and social reintegration[6].

Therefore, the present study aims to evaluate the incidence of clinical and neurological changes in the post-COVID-19, among users of Primary Health Care (PHC), in the city of São João del-Rei, Minas Gerais.

METHOD

Sample

This is an original longitudinal study in which the descriptive quantitative research method was used to collect data for later analysis.

This study, CAAE 48772621.6.0000.9667, followed the recommendations of Resolution 466/2012 of the National Health Council (CNS) for studies with human beings and only began after approval by the Research Ethics Committee (CEP) of the President Tancredo de Almeida Neves University Center (UNIPTAN), through the Brazil Platform. The project was approved by means of Opinion No. 6.096.938.

The research was carried out in person from August 30, 2021, to May 10, 2022, in the city of São João del-Rei/MG, including patients over the age of 18 who had already had COVID-19. To define the sample, contact was made with the Health Department of the municipality in question, presenting the research proposal and collecting the signatures of the Informed Consent Form (ICF).

Patients contacted by the Basic Health Units (UBS's) who had already acquired COVID-19 were interviewed using a questionnaire with 11 (eleven) questions related to the signs and symptoms of the disease in question. The

questionnaire was drawn up by the researchers, together with the project coordinator.

Procedure

The questionnaire contains questions related to the SARS-CoV-2 disease period and the post-illness period. The questions describe: i) whether the patient has acquired COVID-19; ii) if it was one or more times; iii) he was treated at his own home or in the hospital; iv) what was the period of hospitalization, being possible to indicate more than seven or more than fourteen days; v) whether pulmonary involvement was known; vi) what was the involvement of the lung, obtaining the alternatives greater than 25% or greater than 50%; vii) what were the symptoms during the period of illness; viii) symptoms seven days after illness; ix) symptoms 14 days after illness; x) symptoms one month after the illness; xi) and if you still feel something that bothers you.

In order to make it possible to carry out the application of the questionnaire, events were developed within the post-COVID-19 Assessment Journey, which took place in several neighborhoods of the municipality of São João del-Rei in partnership with the UBSs in the city. Patients were invited to participate in the research and signed the consent form authorizing the research.

Statistical Analysis

For analysis of the results, they were compiled in excel spreadsheets and later in the GraphPad Prism 8.0, unpaired test t. The chi-square statistical test was used, considering a significant level of 5%. Data were grouped as mean ± standard deviation.

RESULTS

The results showed that the ages among those evaluated ranged from 19 to 87 years old (average of 54 years old) and that 49 (100%) of UBSs users had COVID-19. Among those evaluated, 47 (95.9%) users had COVID-19 once and two (4.1%) users had the infection twice or more. The patients who underwent treatment at home were 43 users (87.8%) and 6 (12.2%) hospital users. Of the users who were hospitalized, 5 (83.3%) stayed more than seven days and one (16.7%) stayed more than 14 days.

When asking the user if they knew what pulmonary impairment they had, 41 (83.7%) of the users answered that they did not know and 8 (16.3%) users that they knew. Of those who knew about lung involvement, four (50%) users reported that they had more than 25% of the lung compromised and four (50%) more than 50%.

Regarding the general symptoms that users presented during COVID-19, the following were identified from Table 1.

The general symptoms reported by users at different times after COVID-19 showed significant variations ($p<000.1$). Seven days after diagnosis (Table 2), the most

prevalent symptoms were tiredness, weakness, cough, headache, epilepsy and loss of smell. After 14 days (Table 3), tiredness and weakness persisted, with the addition of changes in memory. Finally, one month after diagnosis (Table 4), weakness was no longer reported, while the other symptoms remained.

Table 1. General symptoms present in UBS users during COVID-19.

Symptoms	**% (n)**	**Symptoms**	**% (n)**	*p*
Headache	57.4 (n=27)	Tiredness	53.2 (n=25)	<0.0001
Shortness of breathe	36.2 (n=17)	Motor incoordination	6.4 (n=3)	<0.0001
Cough	53.2 (n=25)	Visual Changes	19.1 (n=9)	<0.0001
Fever	63.2 (n=30)	Memory Changes	25.5 (n=12)	<0.0001
Diarrhea	29.8 (n=14)	loss of taste	57.4 (n=27)	<0.0001
Vomit	12.8 (n=6)	loss of smell	59.6 (n=28)	<0.0001
Abdominal pain	17 (n=8)	Itching	14.9 (n=7)	<0.0001
Dizziness	29.8 (n=14)	Others	51.1 (n=24)	<0.0001
Epilepsy	-			

Table 2. General symptoms present in users after 7 days of COVID-19 diagnosis.

Symptoms	**% (n)**	**Symptoms**	**% (n)**	***p***
Headache	34.1 (n=15)	Tiredness	47.7 (n=21)	<0.0001
Shortness of breathe	20.5 (n=9)	Motor incoordination	11.4 (n=5)	<0.0001
Cough	36.4 (n=16)	Visual Changes	18.2 (n=8)	<0.0001
Fever	9.1 (n=4)	Memory Changes	29.5 (n=13)	<0.0001
Diarrhea	6.8 (n=3)	loss of taste	22.7 (n=10)	<0.0001
Vomit	2.3 (n=1)	loss of smell	31.8 (n=14)	<0.0001
Abdominal pain	9.1 (n=4)	itching	2.3 (n=1)	<0.0001
Dizziness	20.5 (n=9)	Weakness	38.6 (n=17)	<0.0001
Epilepsy	34.1 (n=15)	Tingling	13.6 (n=6)	<0.0001
		Depression	27.3 (n=12)	<0.0001

Table 3. General symptoms present in users after 14 days of COVID-19 diagnosis.

Symptoms	% (n)	Symptoms	% (n)	*p*
Headache	11.5 (n=5)	Tiredness	32.6 (n=14)	<0.0001
Shortness of breathe	16.3 (n=7)	Motor incoordination	7 (n=3)	<0.0001
Cough	14 (n=6)	Visual Changes	14 (n=6)	<0.0001
Fever	-	Memory Changes	37.2 (n=16)	<0.0001
Diarrhea	7 (n=3)	loss of taste	18.6 (n=8)	<0.0001
Vomit	4.7 (n=2)	loss of smell	23.3 (n=10)	<0.0001
Abdominal pain	7 (n=3)	itching	-	<0.0001
Dizziness	14 (n=6)	Weakness	37.2 (n=16)	<0.0001
Epilepsy	-	Tingling	9.3 (n=4)	<0.0001
Lethargy	4.7 (n=2)	Depression	9.3 (n=4)	<0.0001
Others	51.1 (n=24)	Anxiety	27.9 (n=12)	<0.0001

Table 4. General symptoms present in users after one month of COVID-19 diagnosis.

Symptoms	% (n)	Symptoms	% (n)	*p*
Headache	9.8 (n=4)	Tiredness	46.3 (n=19)	<0.0001
Shortness of breathe	17.1 (n=7)	Motor incoordination	4.9 (n=2)	<0.0001
Cough	7.3 (n=4)	Visual Changes	14.6 (n=6)	<0.0001
Fever	-	Memory Changes	31.7 (n=13)	<0.0001
Diarrhea	7.3 (n=3)	loss of taste	14.6 (n=6)	<0.0001
Vomit	4.9 (n=2)	loss of smell	17.1 (n=7)	<0.0001
Abdominal pain	4.9 (n=2)	itching	2.4 (n=1)	<0.0001
Dizziness	9.8 (n=4)	Weakness	-	<0.0001
Epilepsy	2.4 (n=1)	Tingling	-	<0.0001
Lethargy	4.9 (n=2)	Depression	12.2 (n=5)	<0.0001
Others	31.7 (n=13)	Anxiety	26.8 (n=11)	<0.0001

DISCUSSION

Regarding the average age of the research participants, it is observed that they are part of the so-called middle age, according to the World Health Organization (WHO), where the age group comprises between 45 and 59 years. These individuals, therefore, configure themselves as the "standard adult", which refers to citizens who normally already have financial, professional and family stability and, even so, see

work and productivity as an essential activity[7]. Usually, this age group is more exposed to contamination by COVID-19, as they need to continue working.

Regarding SARS-CoV-2 infection, it was observed that most respondents did not develop the severe form of the disease, since 43 (87.8%) of the 49 individuals were treated at home, and even those who were hospitalized, five (83.3%) stayed between one and two weeks in the hospital. This is also confirmed by the prevalence of users (41/83.7%) who were not aware of pulmonary involvement.

Of the most evident symptoms during SARS-CoV-2 infection, fever affected 30 respondents out of 49 (63.2%) users, 28 (59.6%) had anosmia, 27 (57.4%) had dysgeusia, 27 had headache (57.4%), 25 (53.2%) had cough and 25 (53.2%) had tiredness. These results corroborate the study in which the authors also evidenced among users the symptoms of fever, cough, dyspnea, myalgia and fatigue, as well as anosmia and dysgeusia[8]. The symptoms of sputum, headache, hemoptysis, diarrhea, dyspnea and lymphopenia were also evidenced[8]. Other symptoms are reported such as inappetence, myasthenia, malaise, sore throat, nausea and vomiting[9].

Regarding the period after the disease, the patient may have persistent symptoms, defined as post-COVID-19 Syndrome (PCS), which may occur from the seventh day onwards[1]. Thus, symptoms of fatigue were identified among users after the seventh day of infection in 21 users (47.7%), weakness in 17 (38.6%), cough in 16 (36.4%), headache in

15 (34.1%), anosmia in 14 (31.8%) and memory alterations in 13 (29.5%). Fourteen days after the infection, memory alterations were observed in 16 (37.2%) users, weakness in 16 (37.2%), tiredness in 14 (32.6%) and anxiety in 12 (27). 0.9%). Symptoms of tiredness, headache and anosmia were evidenced among those infected after 14 days[10].

After a month of COVID-19 infection, users reported that tiredness symptoms persisted in 19 respondents (46.3%), memory changes in 13 (31.7%) and anxiety in 11 (26.8%) users. These data corroborate with other study, which identified symptoms of tiredness, attention disorder, memory and mental health changes, such as anxiety, among the individuals interviewed one month after the COVID-19 infection[11]. These symptoms are common and may prevail for up to two months after infection[12].

In the present study, it was observed that memory and anxiety symptoms tended to decrease after seven days of infection. Already the symptoms of tiredness and mental problems, such as depression, began to appear with more intensity. Thus, it is noticeable that the symptoms that affect the nervous system tend to change over time, with symptoms related to the mental health of users persisting[13-15]. The symptom of tiredness may be persistent with greater intensity due to permanent involvement in the lung parenchyma, such as diffuse fibrosis caused by the respiratory damage caused by the virus[16-18].

The presence of symptoms in post-COVID-19 demonstrates that the disease does not affect only the

respiratory system, but also the cardiovascular system, since tiredness predominates even after a month after SARS-CoV-2 infection. Some studies report that heart failure is one of the consequences of the infection and that it is characterized by the inability of the human heart to pump blood to the body, leading to tiredness, fatigue, shortness of breath, dyspnea and exercise intolerance[19,20]. Other studies cite viral myocarditis as a sequel, as it is an inflammation of the myocardium that causes fatigue, dyspnea, chest pain and arrhythmias[21-23].

Therefore, there are many symptoms that affect the body of an infected person, and the symptoms persist differently in the body. It is important to identify persistent sequelae and carry out health promotion interventions that enable recovery and improve the quality of life of individuals.

CONCLUSIONS

It can be concluded that the results obtained are like the findings of the studies analyzed regarding the perception of the main symptoms among patients affected by COVID-19, such as weakness, tiredness and memory changes, and their influence on the body as a whole.

Therefore, attention should be paid to the period known as "post-COVID-19 syndrome", which presents persistent symptoms, including those mentioned above, which are still observed a month after infection. These symptoms can be uncertain and manifest themselves variably at each stage of the recovery.

It is therefore believed that the data presented can contribute to identifying the diagnosis and thus induce the appropriate conduct for each patient, providing greater assistance to the population.

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