



## Examining the Prevalence of Long-Covid Symptoms: A Cross-Sectional Study

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### Abstract:

It's increasingly recognized that SARS-CoV-2 can produce long-term chronic complications after recovering from the acute effects of the infection. But little is known about the prevalence, risks, or whether it's possible to predict a long-term course of the disease in the early stages, the resulting quality of life disorder. In this study, the effects of chronic Covid-19 syndromes (CCS) on type, prevalence, quality of life after recovery in Covid-19 patients were investigated. Four weeks after the quarantine period of the patients was completed, a cross-sectional study was conducted with a questionnaire on people reached via Google forms to determine the symptoms of long-Covid. 1044 people over the age of 18, who aren't pregnant, and who have had Covid-19 were included in the analysis. It was determined that 65.6% (n=685) of the participants continued to have symptoms after the PCR test was negative/after they recovered. It was concluded that myalgia, fatigue, joint pain, anosmia was observed in 76.4% (n=797) of the individuals participating in our study. It has been observed that people who have had Covid-19 commonly show additional or ongoing symptoms and associated impairment of quality of life in the short term. It was determined that individuals who initially had a symptom of shortness of breath or lung involvement were more likely to develop long-term symptoms. More importantly, our study revealed that the overall disease level is an important variable that should be considered when assessing the statistical significance of symptoms associated with Covid-19.

### 1. Introduction

Severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) was identified in December 2019

[1]. As of November 8, 2023, SARS-CoV-2 had caused 771.679.618 confirmed cases of coronavirus and 6.977.023 deaths worldwide [2]. In international studies, it was concluded that the protective effect of

vaccines should be increased to reduce virus contagion and mortality rates. Despite the high death rates due to Covid-19, most patients survived. However, the causes of potential systemic symptoms in individuals after the disease have not yet been fully elucidated. This situation will inevitably be an additional public health problem around the world [3]. In the pandemic caused by this new virus, complications due to the prolonged symptoms that occur in recovered individuals as time goes on have become more and more the subject of research. It has been observed that individuals infected with Covid-19 may have symptoms that develop during the infection or appear later, even if they get rid of the virus within 7-14 days [1-4]. The term "long-Covid", which was coined to describe long-term complications that occur after Covid-19 infection, is used to describe long-term normal symptoms such as shortness of breath, headache, body pain, and fatigue, unexplained symptoms such as vertigo, ringing in the ears, intermittent brain fog, palpitations, and dramatic mood swings are also observed in some patients [5, 6]. These prolonged symptoms also attract the attention of health professionals and increase the risk of a new group to be treated. In a study on how long these symptoms can last, it was reported that 74-88% of Covid-19 patients who were hospitalized had symptoms that could last up to 50-80 days, and the most common symptoms were fatigue and shortness of breath [7, 8]. This is an indication that a new patient group has emerged while struggling with Covid-19 in terms of public health. In one of the few studies conducted on this subject, it was reported that 55% of the patients who were discharged after hospital treatment in Italy had 3 or more symptoms lasting for 60 days [7, 9].

We can define the Long-Covid situation as patients with symptoms that develop during or after Covid-19 infection for more than 12 weeks and, we cannot explain it with an alternative diagnosis. These symptoms may appear as groups of symptoms that can show time-dependent changes and can affect any system, often overlapping each other. However, some patients may develop extreme symptoms that cannot be explained by an alternative diagnosis. Although long-term symptoms developing after the disease, which we have observed in viral infections we have encountered so far, are rarely seen [10, 11], the fact that the Covid-19 infection is new, and the uncertainty about it continues, raises concerns about the consequences of the prolonged symptoms that occur after the disease.

Covid-19 infection is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which affects the respiratory system, causes interstitial pneumonia and acute respiratory distress syndrome [12]. However, clinical long-term

symptoms after recovery from acute Covid-19 remain unclear. With the term recently proposed in Nature, the persistence of symptoms in Covid-19 patients was defined as Long-Lasting Covid symptoms and the patients evaluated it prospectively [13]. Few pieces of evidence mention the presence of symptoms that may prevent cardiological, pulmonary, and neurological vital daily functions, apart from symptoms such as shortness of breath, fatigue, and weakness in most patients who recover [12-15]. Doctors do not know what to recommend and how to treat their patients who come for treatment for the course and prognosis of the disease. The lack of understanding of the pathophysiology of Covid-19 on organ systems in the medium and long term is one of the biggest reasons for this [15]. This situation brings with it discussions that long-Covid symptoms (pulmonary involvement during the acute disease) arise from the underlying mechanism of lung involvement in the acute phase of the disease and may be immunological [16].

Therefore, in our study, we tried to answer whether the symptoms in the acute phase of the disease are a recurrent or ongoing infection or a side effect of immunomodulatory therapy, with the thought that it may also cause symptoms in the post-Covid-19 period. We did it to understand better the long-term impact of Covid-19, assess symptoms, and ultimately take preventive measures at the health system level.

## 2. Methods

In our cross-sectional descriptive study, patients diagnosed with Covid-19 and recovered were included in the sample. The criteria of the World Health Organization were considered in determining the participants included in the sampling (such as the absence of fever for three consecutive days, two negative test results 24 hours apart, or completion of a 14-day quarantine period).

A power analysis was conducted to calculate the sample size. The G\*Power 3.1.9.7 program was used to determine the sample of the study [23]. The number of samples to be included in the study was calculated by considering Cohen (1988)'s [24] low/medium effect size recommendation. Accordingly, the effect size was  $f=0.10$  and according to the double-tailed hypothesis method, the confidence interval was determined as 80% [25] and the margin of error was 5%. As a result of the calculation, the number of people to be included in the sample was determined as 788. However, considering the possible data losses, the study was completed with 1044 people. By obtaining the necessary legal permissions, the contact information of people aged 18 and over who were diagnosed with

Covid-19 from the hospital records in a province in Turkey were obtained (Individuals under the age of 18 and pregnant women were excluded from the study). Data were collected between 27 November 2020 and 27 January 2021. Four weeks after the completion of the 14-day quarantine period, the questionnaire created on Google forms was delivered to these individuals as a data collection tool. This questionnaire consists of 24 questions about the Covid-19 disease, such as the sociodemographic characteristics of the participants, the symptoms seen during and after the disease, hospitalization during the disease process, and the duration of the disease symptoms. Statistical evaluation of the data was made in a computer environment with SPSS 22.0 for the Windows computer package program. Descriptive statistical criteria were used in the evaluation of the findings of the study (average, standard deviation, minimum and maximum values, and percentiles). This study was approved by the Republic of Turkey Ministry of Health and Amasya University Non-clinical Research Ethics Committee. The study was conducted under the Principles of the Declaration of Helsinki. Written informed consent was obtained from all participants.

### 3. Results

Between 27 November 2020 and 27 January 2021, 1044 people participated in the study to evaluate the ongoing acute symptoms after Covid-19. Individuals under the age of 18 and pregnant women were excluded from the study.

**Table 1: Demographic and Clinical Characteristics of the Study Sample**

Socio-demographic characteristics		n	%
<b>Age, mean (SD)</b>	35,76±11,51 (min-max=18-79)		
<b>Age</b>	30 years and under	391	37,5
	31-44 years	440	42,1
	45 years and older	213	20,4
<b>Sex</b>	Female	679	65,0
	Male	365	35,0
<b>Smoking status</b>	Yes	193	18,5
	No	752	72,0
	Occasionally	99	9,5
<b>Diagnoses</b>	Yes	302	28,9
	No	742	71,1
<b>Comorbidities</b>	Hypertension	66	6,3
	Diabetes mellitus	24	2,3
	Heart failure	20	1,9
	Chronic kidney disease	1	0,1
	Thyroid disease	54	5,2
	COPD*	5	0,5
	Asthma	44	4,2
	Active cancer	3	0,3
	Immune disorders	13	1,2
	Others	72	6,9
	No comorbidity	742	71,1
<b>Total</b>		<b>1044</b>	<b>100</b>

\*Chronic obstructive pulmonary disease

In Table 1, where the sociodemographic characteristics of the participants were evaluated, it was determined that 42.1% (n=440) of the individuals were between the ages of 31-44 and, the average age was 35.76±11.51 (min-max=18-79) years. It was found that 65.0% of the participants (n=679) were women, 72.0% (n=752) did not smoke, 71.1% did not have any chronic conditions, and 6.3% (n=66) of the individuals who stated that they had chronic conditions had hypertension and immune disorders (Table 1). When the most common symptoms during and after the diagnosis-process of the disease were examined according to the sociodemographic characteristics of the participants, 25.1% (n=262) of the individuals between the ages of 31-44 had body malaise, and 40.3% (n=262) during the disease process (n=302), while fatigue and pain in the whole body are observed, it is seen that fatigue continues at a rate of 45.6% (n=160) after the disease (Table 1).

While 40.6% (n=424) of the women had a complaint of body malaise when they were diagnosed with the disease, 69.1% (n=518) of the women (n=518) had more symptoms of fatigue and pain in the whole body, and the complaint of fatigue after the disease was determined that it continued at a rate of 74.4% (n=261). In the evaluation of the smoking status of the participants, 61.4% (n=462) of the non-smokers (n=752) had complaints of body malaise at the time of diagnosis of the disease, and 71.0% (n=543) had fatigue and fatigue in the whole body during the disease process. It is seen that there is pain, and after recovery, 32.3% (n=243) of them continue to complain of fatigue. It was stated that 61.9% (n=459) of individuals (n=742) who did not have any chronic disease had complaints of fatigue when they were diagnosed with the disease, and 71.0% (n=527) had complaints of fatigue and pain in the whole body during the disease process. It was determined that the complaint of fatigue continued in 30.9% (n=229) after recovery. Among the individuals (n=302) who stated that they had a chronic disease, 57.6% (n=38) of the individuals with hypertension had complaints of malaise when the disease was diagnosed, 69.7% (n=46) had fatigue during the disease process, and the whole body. It is seen that there are symptoms of pain, and 28.8% (n=19) of them continue to complain of fatigue after recovery.

When we examine the information about the Covid-19 Pandemic and disease processes of the participants, 64.9% (n=678) of the individuals adhere to the rules of the mask, social distance,

disinfectant use, hand washing, avoiding being in closed places before they get Covid-19. 87.6% (n=915) stated that they had a PCR test for the diagnosis of Covid-19 disease, 28.9% (n=302) stated that they applied to a doctor immediately after Covid-19 symptoms appeared. In addition, 23.0% (n=240) of the participants stated that the disease process lasted for 10-12 days, 57.7% (n=602) did not have PCR test again during the recovery period, 84.7% (n=884) stated that they used drugs during the disease, 80.7% (n=842) specified that they used supportive (vitamin/food supplement) products during the disease process. 88.2% (n=921) of the individuals did not have hospitalized during the disease process, 32.2% (n=40) of the individuals (n=123) hospitalized were hospitalized for 10 days or more, and n=16 patients, On the other hand, it was determined that n=9 people who were treated in the intensive care unit stayed in the intensive care unit for 10 days or more.

Table 2, which contains information about the disease process and aftermath of the participants, shows that n=10 of the individuals treated in the intensive care unit (n=16) received oxygen by mask during the treatment process and that 96.8% of the participants (n=16) received oxygen during the treatment process (n=1011) were not given blood plasma, and 65.6% (n=685) of the disease symptoms continued after the PCR test was negative or after recovery. Additionally, 41.5% of the individuals (n=433) stated that the symptoms they experienced after the Covid-19 disease process affected their quality of life, and 30.7% (n=321) of the individuals stated that the symptoms continued after the disease process affected their quality of life. It was determined that he did not have any idea about how long these symptoms would continue. While it was seen that 94.0% (n=981) of the participants did not need physical therapy after the PCR test was negative or recovered, and 71.6% (n=748) of the individuals did not go to a doctor's control after this process, 51.1% (n=533) stated that they have a fear of being caught again with Covid-19 (Table 2). In Figure 1, where the participants had symptoms related to the diagnosis of Covid-19, it was determined that 61.4% of individuals (n=641) were diagnosed with Covid-19 with a complaint of body malaise, while 21.1% (n=220) were admitted to the hospital with a symptom different from the symptoms contained in the question form. In Figure 1, where the participants had symptoms related to the diagnosis of Covid-19, it was determined that 61.4% of individuals (n=641) were diagnosed with Covid-19 with a complaint of body malaise, while 21.1% (n=220) were admitted to the hospital with a symptom different from the symptoms contained in the question form.

**Table 2: Information about the Disease Process and Aftermath of the Participants (n=1044)**

Information on the Covid-19 Pandemic		n	%
Treatment status in people staying in intensive care	Oxygen therapy with mask	10	1,0
	Oxygen therapy with intubation	3	0,3
	Ventilation, Noninvasive or Mechanical	3	0,3
	Not in intensive care	1028	98,4
Continuation of disease-related symptoms after a negative PCR test or after recovery	Yes	685	65,6
	No	359	34,4
The effect of symptoms after Covid-19 treatment on quality of life	Yes	433	41,5
	No	291	27,9
	Rarely	320	30,6
The condition of thinking about how long these symptoms will last for individuals who think that the symptoms that occur after Covid-19 treatment affect their quality of life	A few weeks	172	16,5
	A few months	231	22,1
	Up to 1 year	29	2,8
	I have no idea about this	321	30,7
	The disease did not affect the quality of life	291	27,9
The condition of needing physical therapy after the period when the PCR test came back negative or after recovery	Yes	63	6,0
	No	981	94,0
The condition of individuals being under the control of a doctor after a negative PCR test or after recovery	Yes	296	28,4
	No	748	71,6
The situation of experiencing the fear of contracting covid-19 again	Always	533	51,1
	Sometimes	394	37,7
	He does not experience fear	76	7,3
	Once the patient believes that he will gain immunity	41	3,9
<b>Total</b>		<b>1044</b>	<b>100</b>

In the question form, these people who marked the “other” option were asked to explain which complaint they applied with, and it seems that 21.4% of the respondents who marked the other option (n=47) had a sore throat. During the disease process, 71.8% of individuals (n=750) reported that they complained of weakness and pain throughout the body, and 33.6% (n=351) continued to complain of weakness after the PCR test was negative or after the quarantine period expired (Figure 1). This table also compares the continuation of symptoms seen during Covid-19 after Covid.

Among the symptoms seen in individuals (n=168) after the PCR test is negative or after the quarantine period has expired, the symptoms called other, although rare, reveal interesting results in general. In

these patients, skin rash (n=6), hair loss (n=13), vertigo (n=12), coagulation disorder (n=8), cardiac problems (n=7), metallic taste in the mouth (n=23), symptoms such as bad feeling of all odors (parosmia) (n=31), decreased exercise capacity (n=46), Dysgeusia (n=5), loss of appetite (n=2), muscle cramps (n=15) they have reported.

#### 4. Discussion and Conclusion

Our research reveals the fact that we are faced with a new patient group that needs to be approached with a multidisciplinary study after Covid-19. It was determined that 65.6% (n=685) of the patients who participated in our study continued to have symptoms after the PCR test was negative or after they recovered. It was concluded that myalgia, fatigue, joint pain, and anosmia, among these symptoms, were seen in 76.4% of the patients who participated in our study. It is clear that such symptoms, especially myalgia and feeling of fatigue, are seen not only in viral infections but also in bacterial infections [17]. In our study, we do not think that long-Covid symptoms are caused by a recurrent or ongoing infection, since the patients were considered to have completely recovered based on the test results or time. It is thought that the symptoms may be due to the continuation of the cytokine storm that occurs especially during the disease [18]. To explain this situation in recovering patients, the necessity of controlling cytokine values is supported by some studies [19-21].

Since the beginning of the epidemic, not enough time has passed to obtain and study long-term results. This may be due to the prevalence of post-traumatic stress disorders and comorbid depressive symptoms in doctors, nurses and healthcare personnel working during the COVID-19 pandemic [22]. However, our study reveals that after long-Covid, there is a need for a special outpatient clinic service for the mid-and long-term evaluation and monitoring of organ functions, beyond symptoms and blood analysis, even if it carries low risk, regularly. The concern that patients may show immunological, haematological, and genetic symptoms after Covid-19 infection in longer-term studies should be investigated in these outpatient clinics. At the top of our concerns about Covid-19 is the possibility that these symptoms may become chronic, or can they progress further, revealing a serious prognosis? is the question. Supportive studies on this subject have been initiated in various countries, especially in England, in a way that justifies our results [23-26]. SARS-CoV-2 is a very new virus, since it only emerged at the end of 2019 and began to affect the human population, extensive

research for long-Covid symptoms has not yet been revealed. There is a need for well-executed large, comprehensive, and long-term studies to solve the problem.

#### Author Statements:

- **Ethical approval:** Ethics committee permissions were obtained for our original study with the decision of the Ministry of Health dated 01-Nov.-2020 and numbered 2020-11-01T13-12-50 and the decision of the Amasya University Non-Interventional Clinical Research Ethics Committee numbered 03-Dec.-2020 and 124.
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- **Author contributions:** AS conceived the study; AS, GÜ, DÇ collected the data; AS and DÇ, TA, GÜ analyzed and interpreted the data; AS and DÇ, TA, DN, YZ, JK, GÜ, MK contributed to the drafting and critical review of the manuscript. All authors contributed to the final review of the manuscript.
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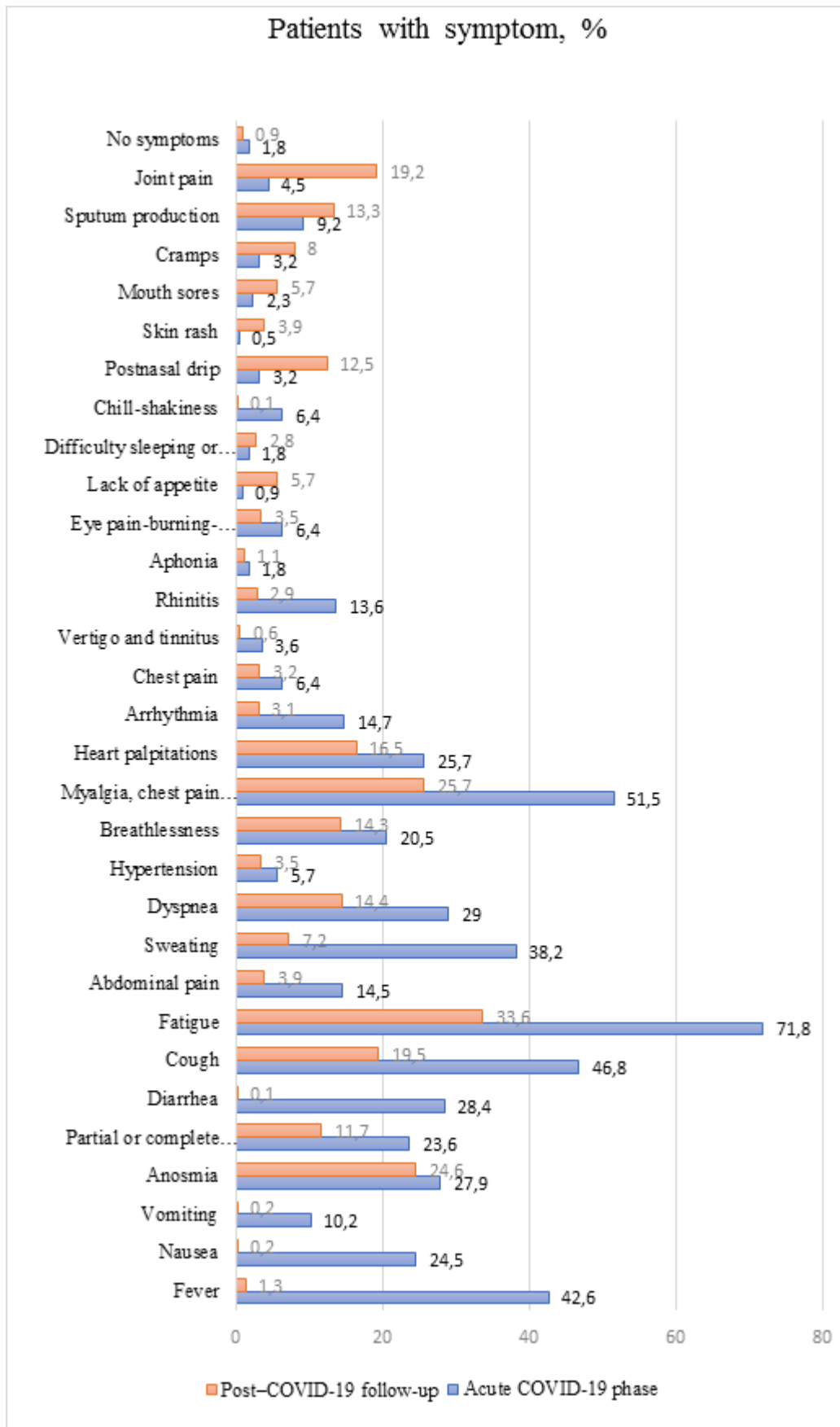


Figure 1: Symptoms Observed in Participants After Covid-19 Diagnosis and After the Disease

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