The Long-Term Somatic and Psychological Impact of Post-COVID Experience on Infected Patients

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Abstract

Introduction: Many studies have focused on describing the acute phase of COVID-19 infection, but few have addressed the impact of the disease and the potential sequelae it may induce. Survivors of SARS-CoV-2 infection have reported physical and psychological sequelae, ranging from exhaustion to complete functional impairment. The aim of this study was to examine the symptoms experienced by patients affected by COVID-19 post-infection and their associated factors.

Methods: This descriptive longitudinal study involved patients who tested positive for SARS-CoV-2 and contacted EMS 03 between December 1, 2020, and January 31, 2021.

Results: A total of 224 (28.9%) patients were included in the study. The majority of patients continued to experience symptoms in the post-COVID-19 period, with varying durations. Most patients (n=191; 85.3%) exhibited at least one somatic symptom 15 days after the infection, with the percentage decreasing over time. These symptoms ranged from mild discomfort to severe and debilitating complaints. Zinc intake and the duration of remission during the acute phase were identified as independent risk factors associated with persistent symptoms during all follow-up periods. Female gender was found to be an independent risk factor for symptom persistence at 2 months of follow-up.

Conclusion: This study suggests that patients recovering from COVID-19 may manifest multi-systemic symptoms over the long term. Rehabilitation and professional reintegration appear to be crucial, especially for severe COVID-19 survivors.

Keywords: Post-COVID, Long-Term, Psychological impact, Emergency, Outcomes

Introduction

The coronavirus disease 2019 pandemic is a disease linked to the SARS-CoV-2 coronavirus pathogens and is one of the epidemics that have emerged over the last five decades caused by zoonotic viruses; it appeared in November 2019 in Wuhan [1], before spreading around the world to cause a pandemic declared by the WHO on March 11, 2020, either the first pandemic caused by a[2]; on 2021, either one year after the declaration of the pandemic, the cumulative number of cases worldwide exceeded 100 million, including around 2,520,653 deaths (2.2%)[3]. This pandemic also had a disastrous socio-economic impact, with economic growth of -4.4%, compared with the 2.7% growth initially forecast in the 2020 finance law [4];

Since the first case was documented on March 02, 2020, 233 277 cumulative cases and 8051 deaths one year later (3), associated with a huge overload of hospitals and a total saturation of intensive care units, given that acute COVID-19

generally, lasts up to 4 weeks, with an evolution that might involve several complications with variable levels of severity. Beyond this period, the ability of SARS-CoV-2 to replicate has not been proven [5].

Like acute COVID-19, long COVID can have even more harmful clinical, socio-demographic, and economic effects, it can affect multiple organs and systems; these symptoms may appear in both hospitalized and non-hospitalized patients who describe persistent symptoms they are enduring [2]. There is no consensual definition of "long COVID"[6][7]. The literature agrees on using the term "persistent COVID" (Subacute/Ongoing COVID) for symptoms or side effects of COVID-19 that persist for 4 to 12 weeks, while "chronic COVID" or "post-COVID syndrome" (Chronic/Post-COVID) refers to symptoms lasting beyond 12 weeks without any other identifiable cause.

This clinically unspecific syndrome, which is not fully assimilated, needs to be placed in perspective with known and well-defined post-infectious syndromes. This syndrome has yet to be studied in depth, due to a lack of solid evidence concerning its physiopathology. Considering its estimated prevalence, the "long COVID" should be considered as an opportunity to assess the complexity of post-infectious syndromes. In this study, we explore the issue of post-COVID-19 symptoms, commonly referred to as "long COVID" in the literature. Our objective is to study post-COVID-19 symptoms along with their associated factors in patients with COVID-19.

Methods

***Study design**:* We conducted a longitudinal study of the emergency medical services in the Eastern central region of Tunisia over a period of two months (December 2020 to January 2021). EMS manages the pre-hospital medical emergencies. Throughout the coronavirus disease 19 pandemic, a sub-unit was created to receive calls for polymerase chain Reaction (PCR) testing, at the EMS car park.

***Study population and sampling**:* we enrolled all patients who contacted EMS regulation with clinical symptoms related to coronavirus disease 19, confirmed by either a positive PCR or rapid test, between 1st December 2020 and 31st January 2021.

***Data collection**:* Trained research staff collected data through phone calls. Study aims were explained to participants who received assurance regarding data confidentiality. Data was initially collected on the 15th day of infection and subsequently at 1 month, 2 months, and 3 months. A pre-tested questionnaire was used to evaluate socio-demographic characteristics, lifestyle habits, and medical history. The gathered data comprised: age, gender, healthcare occupation, smoking habits, comorbidities, and body mass index (BMI). Additionally, we acquired information about symptoms, prescribed treatments, and recovery process, and evaluated mental health (specifically depression and post-traumatic stress), using validated questionnaires. COVID-19 diagnosis was confirmed through either Rapid Antigen Testing or PCR Testing.

Variable definition: ***Post-coronavirus disease 19 conditions (Long COVID):*** pathological state in which a patient experiences persistent signs or symptoms during or after a COVID-19 infection, which may last for more than four weeks without a clear diagnosis [2][8]. ***Post-traumatic stress disorder (PTSD):*** evaluated by the PCLS [9], includes 17 items; all items are rated on a 5-point Likert scale. Score: From 17 to 33: a low probability of PTSD. More than 44: confirmed PTSD**.** ***Depression:*** assessed with the MDI scale, as suggested by the WHO. It contains 10 items rated on a 6-point Likert scale [10]. The scale score ranges from zero to 50 and higher scores indicate a high level of depression.

A score of 31 or higher indicates severe depression.

Statistical analysis: data analysis was performed using the SPSS statistical package. Continuous variables were described as means ± standard deviations when normally distributed and as medians with their 25th and 75th percentile, when not. Categorical variables were summarized with absolute and relative frequencies. In univariate analysis, we compared categorical variables using chi-square and Fisher's exact tests. We compared continuous variables using the Student t-test and the Mann-Whitney U-test. Logistic regression with the stepwise method of Hosmer and Lemeshow was used to identify independent predictors of post-coronavirus syndrome.

The logistic regression model has included variables whose univariate test value was less than 0.20. Relative risk (RR) and 95% confidence interval (CIs) were calculated and presented to estimate the risk factors. We defined statistical significance at p-value < 0.05.

Ethical considerations: The study population was informed of the objectives of the survey. Oral and informed consent was obtained from the participants. The anonymity of the patients was respected.

Results

A total of 224 patients were included, with a median age of 43 years [33, 58] and with extremes ranging from 15 to 85 years. More than half of the patients were female, with a sex ratio of 0.8**.** ***(Table 1)***

The majority of our patients remained symptomatic after 15 days of coronavirus disease 19 (85.3%), although the duration of their symptoms varied; in fact, 71% and 62.5% had at least one symptom after 2 and 3 months of infection, respectively (the time of PCR positivity). *(Figure 1).*

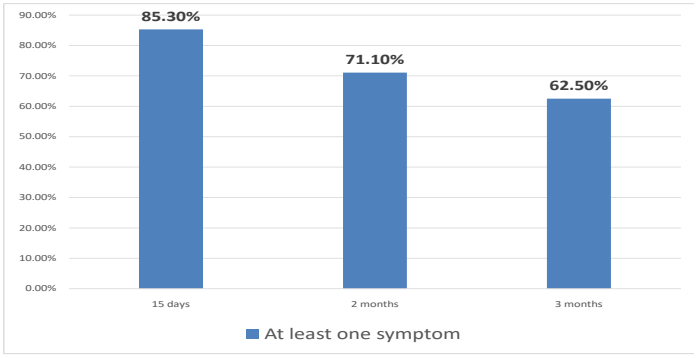

Figure 1: Evolution of somatic symptoms among patients with a COVID-19 infection

The most common systemic symptoms reported by patients were asthenia (25.7% at 3 months), musculoskeletal pain (17.9% at 3 months), and anorexia (5% at 3 months).

Table 1: Socio-demographic characteristics and different patients' treatment with coronavirus disease 19 infections between 01 December 2020 and 31 January 2021

Characteristics		n	%
Age**med[IQ]***		*43 [33.0;58.0]*	
Gender	**Male**	*100*	*44.6*
	Female	*124*	*55.4*
Governorate	**Sousse**	*205*	*91.5*
	Monastir	*006*	*02.7*
	Mahdia	*013*	*05.8*
Comorbidities	**None**	*118*	*52.7*
	Hypertension **	*028*	*12.5*
	Diabetes	*022*	*09.8*
	Dysthyroid	*008*	*03.6*
	Dyslipidemia	*007*	*03.1*
	Asthma	*007*	*03.1*
	Psychiatry	*007*	*03.1*
Life habits	**Current smoker**	*036*	*16.1*
	Smoking cessation	*019*	*08.5*
BMI*****med[IQ]***		*22.55 25.19]*	*[20.22;*
Treatment received	**Vit C**	*174*	*84.1*
	Vit D	*153*	*79.9*
	Zinc	*151*	*73.3*
	Azithromycin	*138*	*66.7*
	LMWH	*044*	*21.3*
	Corticoids	*037*	*17.9*
	Intra venous antibiotic	*028*	*13.5*
	Paracetamol	*082*	*39.6*
	Famotidine	*017*	*08.2*
	other	*037*	*18.0*

Regarding cardiopulmonary symptoms, dyspnea was the most frequent (32.1% at 3 months), whereas only 4.6% of patients reported coughing at 3 months. Palpitations and chest pain were noted for 18.1% and 11.5% of patients respectively at 3 months. Regarding neuropsychiatric symptoms, memory, concentration, and sleep problems were reported by several patients, at rates of 36.7%, 16.9%, and 16.9% respectively after 3 months. Headaches were comparatively less frequent at 11.9% after 3 months. Additionally, depression and post-traumatic stress disorder were diagnosed in 6.9% and 5% respectively after 3 months. Patients also reported ENT symptoms of anosmia and ageusia at 8.2% and 5%, respectively, after 3 months. The incidence of gastrointestinal symptoms was minimal, with only 14.4% of patients registering such complaints at 2 months and 13.1% at the 3-month follow-up *(Table 2).*

We examined the factors linked with symptom persistence following COVID-19 infection. Our analysis identified that persisting symptoms for at least two months after infection correlated with being female (p=0.039), having at least one comorbidity (p=0.010), having a previous history of psychiatric illness, and a longer time to remission (p=0.014). The study investigated the effectiveness of various treatments in managing COVID-19 symptoms. The tested treatments included azithromycin (p=0.005), vitamin C (p=0.021), vitamin D (p=0.039), Zinc (p=0.000), and low molecular weight heparin (LMWH) (p=0.015). After three months of infection, the persistence of one or more symptoms was linked to the presence of comorbidities (p=0.001), a history of psychiatric illness (p=0.037), and time to remission (p=0.004) **(**Table 3). Univariate analysis of the persistence of at least one. The multivariate analysis showed that the independent risk factors associated with the persistence of at least one symptom after 2 months were: zinc intake (p=0.015), female gender (p=0.015), and time to remission (p=0.030) symptom among patients with Coronavirus disease infection)

At 3 months, the factors identified were zinc intake (p=0.018) and time to remission, which was also associated with the persistence of symptoms during the three months of follow-up (p=0.012) *(Table 4).*

Table 2: Evolution of the different symptoms in patients with a COVID-19 infection during the period from 01st December 2020 to 31st January 2021

		At 15 days (%)	At 2 months (%)	At 3 months (%)
No symptoms		033(14.7)	065 (29.0)	084 (37.5)
At least 1 symptom		191(85.3)	159 (71.0)	140 (62.5)
General symptoms	*Asthenia or fatigue*	144 (64.6)	077 (34.4)	056 (25.7)
	Anorexia	079 (35.6)	021 (09.5)	011 (05.0)
	Weight loss	061 (27.6)	011 (05.0)	008 (03.6)
	Myalgia	056 (25.6)	044 (20.2)	039 (17.9)
	Hair loss	017 (07.8)	020 (09.2)	019 (08.8)
Respiratory symptoms	*Dyspnea*	130 (58.3)	086 (38.4)	070 (32.1)
	Palpitations	061(28.0)	054 (24.8)	039 (18.1)
	Cough	058 (26.0)	014 (06.3)	010 (04.6)
	Chest pain	035 (16.1)	031 (14.2)	025 (11.5)
Neurological symptoms	*Memory problems*	092 (42.0)	086 (39.4)	080 (36.7)
	Trouble concentrating	082 (37.1)	073 (33.3)	065 (29.7)
	Troubles sleeping	074 (33.5)	056 (25.5)	037 (16.9)
	Headaches	073 (33.2)	039 (17.7)	026 (11.9)
Digestive symptoms	*Digestive disorders*	047 (21.3)	032 (14.4)	029 (13.1)
	Dysphagia	014(06.3)	09(04.1)	006 (02.7)
ENT symptoms	*Anosmia*	071(32.0)	27(12.2)	018 (08.2)
	Ageusia	053(23.7)	17(07.7)	11 (05.0)
	Dysphonia	035(15.7)	14(06.3)	11 (05.0)
SPUPD		033(14.9)	27(12.2)	25 (11.4)
Psychiatric symptoms	*PTSD possibly probable*	____	194(86.6)	199 (90.9)
	PTSD or other anxiety disorders are quite likely	____	012(05.4)	009 (04.1)
	PTSD confirmed	____	013(05.8)	011 (05.0)
	Depression	033(15.0)	014(06.4)	015 (06.9)
Time to PCR		003 [02; 04]	003[02; 04]	003 [02; 04]
Time to remission		010 [10;15]	13[10;15]	010 [10;15]

SPUPD: polyurea-polydipsic syndrome; **PTSD**: post-traumatic stress disorder

Discussion

Several studies have documented the persistence of COVID-19 sequela and symptoms after its acute phase [1][2]. These studies were difficult to compile due to the wide variability in the patients surveyed, the duration of follow-up after the acute episode, and symptom collection methods.

Table 4: Multivariate analysis of persistence of at least one symptom among patients with COVID-19 infection between 01 December 2020 and 31 January 2021

		p	ORa	[IC95%]
In 15 days	Zinc intake	0.001	4.4	[01.85; 10.62]
	Remission delay	0.021	1.2	[01.30; 01.54]
In 2 months	Zinc intake	0.001	3.2	[01.59; 06.50]
	Gender (female)	0.015	2.2	[01.18; 04.35]
	Remission delay	0.030	2.8	[01.10; 07.56]
In 3 months	Zinc intake	0.018	2.1	[01.13; 03.90]
	Remission delay	0.012	1.1	[01.02; 01.20]

In our study, as in many others worldwide, we found that the majority of patients retained at least one symptom after 1 month (79.5%), this prevalence decreased throughout follow-up. Nevertheless, our patients retained at least one symptom even after three months [11].

However, the severity of the clinical presentation during the acute phase seems to be associated with the prevalence and duration of symptom persistence, which can last up to 9 months [12][13]. The severity of the initial clinical presentation may

Table 3: Univariate analysis of the persistence of at least one symptom among patients with COVID-19 infection between 01 December 2020 and 31 January 2021 (Part1)

Characteristics		In 15 days			In 2 months			In 3 months		
		No symptom n (%)	At least one symptom n(%)	p	No symptom n (%)	At least one symptom n(%)	P	No symptom n (%)	At least one symptom n(%)	p
Age		44 [25.0,75.0]	43 [33.0,43.0]	0.956	39.5 [28,3;58,0]	43.0 [33.0 ;57.0]	0.513	39.0 [34.0 ;57.8]	44.0 [34.0 ;57.8]	0.519
Gender	*Male*	017(48.5)	083(43.5)	0.390	036(55,4)	064(40.3)	**0.039**	041(48.8)	059(42.1)	0.331
	Female	108(87.1)	016(12.8)		029(44,6)	095(59.7)		043(51.2)	081(57.9)	
Healthcare staff		009(28.1)	036(18.8)	0.265	014(21,9)	030(18.9)	0.610	021(25.3)	023(16.4)	0.108
Comorbidity	*At least one*	011(33.3)	095(49.7)	0.081	022(33,8)	084(52.8)	**0.010**	028(33.3)	078(55.7)	**0.001**
	Hypertension	006(18.2)	035(18.3)	0.984	009(13.8)	033(20.8)	0.229	013(15.5)	029(20.7)	0.331
	Diabetes	003(09.1)	023(12)	0.846	006(09.2)	021(13.2)	0.407	006(07.1)	021(15)	0.080
	Dysthyroid	001(03)	008(04.2)	0.750	002(03.1)	008(05.1)	0.516	003(03.6)	007(05)	0.609
	Asthma	000(00.0)	009(04.7)	0.089	001(01.5)	008(05)	0.187	001(01.2)	008(05.7)	0.095
	Psychiatric illness	000(00.0)	007(03.7)	0.264	000(00.0)	007(04.4)	**0.027**	000(00.0)	007(05)	**0.037**
Life hab	*Non-smoker*	012(63.2)	117(70.9)	0.485	030(75)	099(68.8)	0.445	044(78.9)	085(66.4)	0.097
	Current or severe smo	007(36.8)	048(29.1)	0.485	010(25)	045(31.3)		012(21.4)	043(33.6)	0.097
	Current smoker	003(15.8)	033(20)	0.661	006(15)	030(20.8)	0.411	008(14.3)	028(21.9)	0.232
BMI		21,6 [19,5; 25,3]	22,6 [20,3; 25,3]	0.658	22.5 [20,5 ;25,0]	22.6 [20.2 ;25.4]	0.950	22.2 [20.1 ;24.8]	22.8 [20.2 ;25.7]	0.322

BMI: body mass index**:** arterial Hypertension **LMWH:** low molecular weight heparin **ATB:** Intravenous antibiotic

Table 3: Univariate analysis of the persistence of at least one symptom among patients with COVID-19 infection between 01 December 2020 and 31 January 2021 (Part2)

		In 15 days			In 2 months			In 3 months		
Time to PCR		002 [02; 04]	003 [02; 04]	0.336	03.0 [2,0 ;4,0]	03.0 [2.0 ;4.0]	0.331	03.0 [02.0 ;04.0]	03.0 [02.0 ;04.0]	0.958
Time to remission		10 [10.0,10.0]	10 [10.0,15.0]	**0.004**	13.0 [10,0 ;15,0]	**0.007**		10.0 [10.0 ;14.0]	13.0 [10.0 ;15.0]	**0.004**
Hospitalized		002(06.1)	031(16.2)	0.095	0.05(07.7)	028(17.6)	0.057	008(09.5)	027(19.3)	0.051
Treatment received	*None*	009(29)	006(03.1)	**$<10^{-3}$**	012(19)	003(01.9)	**$<10^{-3}$**	012(14.6)	003(02.1)	**$<10^{-3}$**
	Azithromycin	011(35.5)	127(66.5)	**0,001**	030(47.6)	108(67.9)	**0.005**	048(58.9)	090(64.3)	0.394
	Paracetamol	006(19.4)	076(40)	**0.027**	019(30,6)	063(39.6)	0.215	026(32.1)	056(40)	0.241
	Vit C	018(58.1)	156(81.7)	**0.003**	043(68.3)	131(82.4)	**0.021**	059(72)	115(82.1)	0.075
	Vit D	014(54.2)	139(72.8)	**0.002**	037(58.7)	116(73)	**0.039**	053(64.6)	100(71.4)	0.291
	Zinc	011(35.5)	140(73.7)	**$<10^{-3}$**	029(46)	122(77.2)	**$<10^{-3}$**	047(57.3)	104(74.8)	**0.007**
	LMWH	002(06.5)	042(22)	0,044	006(9.5)	038(23.9)	**0.015**	009(11)	035(25)	**0.011**
	Corticoids	003(09.7)	034(17.8)	0.260	007(11.1)	030(18.9)	0.162	009(11)	028(20)	0.082
	IV ATB	001(03.2)	027(14.1)	0.052	005(07.9)	023(14.5)	0.186	007(08.5)	021(15)	0.162
	Famotidine	001(03.2)	016(08.4)	0.269	004(06.3)	013(08.2)	0.644			
Evolution							006 (07.3)	011 (07.9)	0.884	
Improvement		032 (97)	185(96.9)	0.973	063(96.9)	154(96.9)	0.979	082(97.6)	135(96.4)	0.620

contribute to the persistence of symptoms, as shown by certain studies which have found that hospitalized patients, in comparison with those who received ambulatory treatment, retain sequela in around 50% of cases, even after 6 months of evolution [14][15][16].

Our results, like previous studies, suggest that long-term coronavirus disease can be represented by a wide range of physical and psychological symptoms [17], with varying frequencies from one study to another [18]. We were able to identify over 20 somatic symptoms, with the most persistent ones reported being: asthenia, dyspnea, concentration, and memory problems, and others less frequently reported such as sleep disturbances, anorexia, palpitations, headaches; were asthenia, dyspnea, concentration, and memory problems, while others less frequently reported were sleep disorders, anorexia, palpitations, headaches, digestive disturbances, anosmia, anorexia, cough, chest pain, joint pain, loss of taste, dysphonia, weight loss, and dysphagia [18][19][20]. Therefore, the "long Covid", as shown by our study, was essentially manifested by persistent asthenia, dyspnea, but also concentration and memory disorders, raising questions among several authors regarding the relationship between post-COVID asthenia and chronic fatigue syndrome (CFS), which has been defined as a different clinical syndrome, although the symptoms are very similar [21][22]. CFS is often due to an impairment of cardiac, pulmonary, or renal function [23]. Therefore, for patients suffering from persistent and debilitating fatigue following COVID-19, documented organ

damage may be a plausible explanation for their fatigue. Therefore, more detailed longitudinal studies evaluating both symptoms and physiological function are required. In our study, the second most frequently reported symptom was dyspnea. We found a prevalence of 50.2% at 1 month, 38.4% at 2 months, and 32.1% at 3 months. Existing data, although limited, reported that exertional dyspnea without hypoxemia was found, according to some studies, in 15% to 40% of patients with mild-to-moderate COVID-19 nearly 3 months after recovery [11][24]. This persistent dyspnea was significantly correlated with younger age, a more severe form of COVID-19, and the diagnosis of a pulmonary embolism complicating COVID-19[25]. In addition to the symptoms described above, neuropsychiatric manifestations were widely reported by patients in post-COVID. In our study, several symptoms such as memory, concentration, and sleep disorders persisted among patients. Intense headaches, sometimes resistant to treatment, were also reported at a lower frequency. This may be attributed to the neuroinvasive effect of coronaviruses, which can cause further inflammation and neurodegeneration. Coronaviruses can cause demyelination, neurodegeneration, and cellular senescence [26], which accelerates cerebral aging and worsens neurodegenerative pathology [27][28]. These neuropsychiatric manifestations can also be seen following viral infection or may

be due to the host's immune response [29]. It is only during the acute phase that the neuro-invasive properties of SARS-CoV-2 can lead to the senescence of various CNS cell types [28]. Our results indicated that being female is associated with symptom persistence (OR=2.26; p=0.015). This has been proven in the literature, especially regarding the persistence of anxiety, depression, and poor sleep quality [30]. However, other factors may be involved, such as young age, rural area of residency, previous functional limitation, smoking, history of high blood pressure, and, above all, duration of hospitalization[18][31]. In our study, as in others, the delay to remission also appears as a factor associated with the persistence of symptoms after 1 month (OR=1.18; p=0.01), after 2 months (OR=2.89; p=0.030) and even after 3 months (OR=1.108; p=0.012)(19). Zinc sulfate intake was also associated with the persistence of symptoms after 1 month (OR=3.44; p=0.001), after 2 months (OR= 3.21; p=0.001), and after 3 months of follow-up (OR= 2.09; p=0.018). No published study has shown a direct association between the persistence of symptoms and the use of zinc sulfate during the acute phase of COVID-19 infection [32]. At the onset of the pandemic, patients started to overuse treatments such as vitamins, Zinc, and azithromycin, mostly without medical advice. This suggests that patient complaints may be more related to treatment side effects. Given the limited therapeutic options for the prevention and treatment of occasionally severe acute viral infections, further research is required to better understand the action mechanisms of zinc, routes of administration, formulations; optimal doses [32], as well as the earliest time at which zinc should be administered following an acute infection and the duration of this therapy [33].

This study is among the first ones to examine the experience of patients in the post-infection period with COVID-19 in our region. It is distinguished from other studies by its regular follow-up from 15 days after the PCR to 3 months afterward. Many early descriptive studies concerning COVID-19 focused on severe forms among hospitalized patients. Data on outpatients, and their long-term evolution, are more limited. This study included outpatients with mild-to-moderate acute infections as well as hospitalized patients. Our study highlighted a broad range of clinical manifestations reported in post-COVID-19 infection, with respiratory, systemic, and cognitive signs in the first place. As a result, the manifestations of long-term COVID-19 must be detected and treated in optimum time. However, the limitations remain essentially logistical, related to the difficulties of reaching patients by phone; many of the forms missing information; the calls were time-consuming, redundant, and required concentration and effort from the patient, with many of them abandoning the follow-up. We limited this study to a 3-month follow-up, even though, according to the literature, coronavirus disease 19 can persist for up to 1 year or more. Also, we limited the sample to patients contacting the EMS, which may lead to a

selection bias. The questionnaires used were written in French and English, which means that the filling-in of these forms by a different person in Arabic might generate a certain semantic and suggestion bias.

Conclusion

Gaining insight into long COVID provides a chance to improve outcomes for all patients with related conditions. This is why further investigations to understand the mechanisms, risk factors, prognosis, and characteristics of at-risk groups are needed to identify potential therapies for long-term coronavirus disease 19. In addition, several researchers have also noted that research investigating long COVID has so far excluded children and pregnant women. The examination of long COVID among these at-risk populations is essential. At present, rehabilitation and professional reintegration seem to be crucial, especially for severe COVID-19 survivors. “Long COVID” should not fall through the cracks".

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