







# Long COVID in the Faroe Islands: A Longitudinal Study **Among Nonhospitalized Patients**

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Background. Little is known about long-term recovery from coronavirus disease 2019 (COVID-19) disease, especially in nonhospitalized individuals. In this longitudinal study we present symptoms registered during the acute phase as well as long COVID (ie, long-lasting COVID-19 symptoms) in patients from the Faroe Islands.

Methods. All consecutive patients with confirmed reverse transcription-polymerase chain reaction testing from April to June 2020 were invited to participate in this study for the assessment of long COVID. Demographic and clinical characteristics and selfreported acute and persistent symptoms were assessed using a standardized detailed questionnaire administered at enrollment and at repeated phone interviews in the period 22 April to 16 August.

Results. Of the 180 participants (96.3% of the 187 eligible COVID-19 patients), 53.1% reported persistence of at least 1 symptom after a mean of 125 days after symptoms onset, 33.0% reported 1 or 2 symptoms, and 20.1% reported 3 or more symptoms. At the last follow-up, 46.9% were asymptomatic compared with 4.4% during the acute phase. The most prevalent persistent symptoms were fatigue, loss of smell and taste, and arthralgias.

Conclusions. Our results show that it might take months for symptoms to resolve, even among nonhospitalized persons with mild illness course in the acute phase. Continued monitoring for long COVID is needed.

COVID-19; persistent symptoms; longitudinal study; Faroe Islands.

The literature on the inpatient course of illness of coronavirus disease 2019 (COVID-19) has rapidly grown over the past several months [1]; however, little is known about the long-term recovery from COVID-19 in nonhospitalized individuals. COVID-19 is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which mainly affects the respiratory system, causing, for example, interstitial pneumonia and acute respiratory distress syndrome [2]. However, the clinical long-term consequences after recovery of acute COVID-19 are uncertain, and most studies have focused on patients with severe disease in hospital settings. Very few studies have prospectively assessed the persistence of symptoms in patients with COVID-19, or long COVID, the term recently proposed in *Nature* [3]. As yet, there is no consensus on the terminology surrounding "long COVID," but long COVID simply refers to a lengthy period of illness,

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without making assumptions on the underlying cause. An Italian study found that, in patients discharged from the hospital after recovery from COVID-19, 87.4% reported persistence of at least 1 symptom, particularly fatigue and dyspnea [4], while a Chinese longitudinal study reported that 49.6% of recovered patients had 1 or more common symptoms, including physical decline, fatigue, and myalgia, 3 months after discharge [5]. The majority of patients with COVID-19 are, however, not hospitalized, and it is necessary to quantify and characterize long COVID in those not hospitalized to get the full picture of the public health challenge imposed by the pandemic.

In the Faroe Islands, the first point of evidence found that 89% of patients with COVID-19 presented with symptoms (Kristiansen et al, unpublished manuscript, 2020); the most prevalent symptoms were fever, headache, and cough. Furthermore, the intensive testing regime in the Faroe Islands implies that the number of unregistered patients is probably very low [6], which makes this an opportune setting for investigating the persistence of symptoms among patients with initially mild COVID-19. Therefore, we performed this longitudinal study with the aim to describe symptoms in the acute phase and especially long COVID in mainly nonhospitalized patients from the Faroe Islands.

#### **METHODS**

All consecutive patients diagnosed with COVID-19 confirmed by reverse transcription–polymerase chain reaction (RT-PCR) testing of an oropharyngeal swab between 3 March and 22 April 2020 were invited to participate in the study. A task force consisting of medical doctors was established under the Ministry of Health in response to COVID-19 to monitor all isolated patients with diagnosed COVID-19 and their quarantined contacts. The task force recorded baseline symptoms as well as date of onset, date of recovery, and hospitalization. All diagnosed patients were asked permission to be contacted by the research team, with the purpose of assessing persistent symptoms of disease.

Upon acceptance, data on specific symptoms potentially associated with COVID-19 were obtained using a detailed standardized questionnaire administered at enrollment, and subsequently repeated through phone interviews, to evaluate any persistent symptoms. The number of interviews was dependent on how long symptoms persisted and the time from onset of symptoms to first interview. Time from the acute phase to first interview varied mainly due to a workload at times higher than projected among the interviewers. However, all but 7 patients received a minimum of 1 follow-up phone interview (i.e. in addition to the baseline interview). If a participant reported symptoms to have ceased at an assessment or reported symptoms to be stable at 2 consecutive assessment occasions, and more than 2 months had passed since the acute phase, the follow-up was terminated.

Patients were asked to retrospectively recall the presence or absence of symptoms during the acute phase of COVID-19 and whether each symptom persisted at the time of the phone interview. The symptoms could be rated as mild, moderate, or severe. With small children (0–15 years), the parents were asked to estimate their children's symptoms. In addition, basic background information was collected, such as education, smoking, self-rated health, medication use, and chronic diseases. The fatigue impact scale was used to ask patients to score their fatigue. It is a self-reported questionnaire that consists of 8 items, each describing one possible experience of fatigue. Individuals were asked to rate the extent to which fatigue has been a problem for them with regard to each of these items on a scale ranging from 0 (no problem) to 4 (extreme problem) [7].

The Faroese Ethics Committee and Data Protection Agency approved this study. Data collection began on 21 April and ended in August 2020, and informed consent was obtained from all participants.

# **Statistical Analysis**

Descriptive results are presented with means and standard deviations (SDs) for continuous variables and with numbers and percentages for categorical variables. We used the chi-square test, Fisher's exact test, or Mann-Whitney U test to compare

groups (eg, individuals with and without persistent symptoms, age groups, etc), where appropriate. Of note, age was divided into the following age groups: 0–17, 18–34, 35–49, 50–66, and 67 years and older. Analysis of variance was used to compare normally distributed variables such as mean number of symptoms. All analyses were performed using IBM SSPSS version 25. *P* values (2-tailed) less than .05 were considered statistically significant.

# **RESULTS**

A total of 187 patients were potentially eligible for the follow-up assessment; 5 individuals (3%) did not wish to participate and 2 were not reached (1%). Thus, 180 individuals were included in the study. The mean (SD, range) age was 39.9 (19.4, 0–93) years and 98 (54%) were women. Only 8 individuals were hospitalized. The mean length of hospital stay was 2 days (range, 0–11 days). The median age of hospitalized patients was 57 (range, 37–92) years. Seven of the 8 admitted patients had 1 or more comorbidities, such as hypertension, emphysema, asthma, ulcerative colitis, diabetes, and cardiovascular disease (Kristiansen et al, unpublished manuscript, 2020). No fatalities have occurred. The characteristics of the study population are summarized in Table 1.

A total of 99 (55%) patients received 1 follow-up phone interview (ie, in addition to the baseline interview), 33% (n = 59) received 2 follow-up phone interviews, 7% (n = 13) received 3 follow-up phone interviews, and 1% (n = 2) received 4 follow-up phone interviews. The mean (SD, range) number of days from onset of symptoms to first follow-up was 81 (28, 12-153) days and from onset of COVID-19 symptoms to last follow-up was 125 (17, 45-153) days.

During the acute phase of COVID-19, 4.4% (n = 8) were asymptomatic and 7.2% (n = 13) reported 1 or 2 symptoms, while more than 30% had 9 or more symptoms (Table 2). At the last follow-up, 46.9% (n = 84) were asymptomatic, while 33.0% (n = 59) reported 1 or 2 symptoms and 20.1% (n = 36) reported 3 or more symptoms. The most prevalent symptoms during the acute phase were fatigue, fever, headache, chills, and loss of smell and taste, while the most persistent symptoms were fatigue, loss of smell and taste, and arthralgias (Figure 1). The same symptoms, apart from fever and chills, were reported as the most common severe symptoms reported during acute COVID-19 disease, while the most persistent severe symptoms at last follow-up (n = 15) were fatigue, loss of smell and taste, and arthralgias (Figure 2). Of the 172 who reported symptoms at baseline, 95 reported at least 1 persistent symptom at last follow-up. It was particularly those who reported a higher number of symptoms during the acute phase who experienced persistent symptoms or long COVID at last follow-up. Paired data in relation to the most prevalent symptoms (loss of smell and taste, fatigue,

Table 1. Demographic and Clinical Characteristics of Patients With COVID-19 in the Faroe Islands from the First Wave (n = 180)

	Values
Women, n (%)	98 (54.4)
Age, mean (SD), range, y	39.9 (19.4)
	0–93
Age distribution, n (%)	
0–17 y	21 (11.7)
18–34 y	57 (31.7)
35–49 y	39 (21.7)
50–66 y	45 (25.0
≥67 y	18 (10.0)
Level of education, n (%) <sup>a</sup>	
Currently in primary school	20 (11.2)
≤7 y	9 (5.0)
8–9 y	8 (4.5)
10–11 y	49 (27.4)
Upper secondary school	93 (52.0
Completed education, n (%) <sup>b</sup>	
Apprentice-/preliminary business college/business college	20 (17.7)
Other vocational education	15 (13.3
Shorter education (<3 y)	10 (8.8)
Middle education (3–4 y)	50 (44.2
Longer education (>4 y)	18 (15.9
Smoking status, n (%) <sup>c</sup>	
Active smoker	32 (18.4
Occasional smoker	5 (2.9)
Former smoker	41 (23.6
Never smoker	96 (55.2
Daily medication use, n (%)	64 (35.6
Self-reported diseases, n (%)	
Anxiety	1 (0.8)
Asthma	16 (11.8)
Myocardial infarction	3 (2.2)
Carnitine transporter defect	2 (1.5)
Ulcerative colitis	4 (3.0)
Cerebral hemorrhage	3 (2.2)
Heart failure	1 (0.8)
Hypertension	27 (19.4
Hypercholesterolemia	8 (6.0)
Hyperthyroidism	1 (0.8)
Cancer	4 (3.0)
Chronic bronchitis, COPD	3 (2.3)
Hypothyroidism	7 (5.1)
Arthritis	3 (2.3)
Psoriasis	4 (3.0)
Type 1 diabetes	1 (0.8)
Type 2 diabetes	5 (3.7)

N = 180. Abbreviations: COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019: SD. standard deviation.

and headache) from the acute phase and the last follow-up show that 43 (24.3%) reported loss of smell at the last follow-up point among the patients who had symptoms in the acute phase, 29 (16.4%) reported loss of taste, 43 (23.9%) reported fatigue, and 13 (7.3%) reported headache (Table 3). Of

Table 2. Symptoms During the Acute Phase and at Last Follow-up in Faroese Patients with COVID-19 from the First Wave (n = 180)

	Acute COVID-19 Phase	Last Follow-up <sup>a</sup>
Symptoms, n (%)	172 (95.6)	95 (53.1)
Mild	145 (80.6)	79 (44.1)
Moderate	142 (78.9)	42 (23.5)
Severe	145 (80.6)	17 (9.5)
Number of symptoms, n (%)		
None	8 (4.4)	84 (46.9)
1–2	13 (7.2)	59 (33.0)
3–5	43 (23.9)	25 (14.0)
6–8	44 (24.4)	9 (5.0)
9–12	56 (31.1)	2 (1.1)
≥13	16 (8.9)	0
Number of symptoms, mean (SD)	7.7 (3.6)	2.7 (2.3)
Mild symptoms	3.1 (1.9)	1.9 (1.3)
Moderate symptoms	2.8 (1.6)	2.0 (1.3)
Severe symptoms	3.3 (2.2)	1.8 (1.1)

Abbreviations: COVID-19, coronavirus disease 2019; SD, standard deviation. an = 179.

note, 1% did not report these symptoms in the acute phase but reported symptoms at the last follow-up. Among those experiencing fatigue during the acute phase (n = 127) and at the last follow-up (n = 53), the fatigue impact scale score was a mean (SD) of 1.8 (1.1) and 1.2 (1.0), respectively. None of the participants reported fever or any signs or symptoms of acute illness at the follow-up.

Age-stratified analysis revealed a statistically significant difference in occurrence and number of symptoms between different age groups. During the acute COVID-19 phase an overall difference in the presence of symptoms across age groups (yes/no) (P < .0001) was observed, with a significantly higher proportion reporting any symptom in the age groups from 18 to 66 years, compared with the youngest and the oldest groups (P = .01 to P = .005) (Supplementary Figure 1). The youngest age group (0–17 years) reported significantly fewer symptoms compared with the age groups 35–49 years (P = .03) and 50–66 years (P = .03) but had symptoms comparable to the oldest age group ( $\ge$ 67 years). Otherwise, there were no differences across age groups in the presence, the amount, or regarding severity of symptoms (Supplementary Figure 1 and Supplementary Figure 2).

At follow-up, symptoms persisted significantly more frequently among individuals in the 50–66 year age group compared with the youngest groups (0–17 years, P=.003; 18–34 years, P=.001) but not with the 2 other groups. There was no difference regarding the presence or severity of persistent symptoms, but symptoms seemed to be more persistent with increasing age (Supplementary Figure 3).

No differences were found in the presence or severity of symptoms with regard to hospitalization, sex, smoking, selfreported medication use, or chronic diseases overall, or for each

an = 179.

 $<sup>^{</sup>b}n = 113$ 

 $<sup>^{\</sup>circ}$ n = 174.

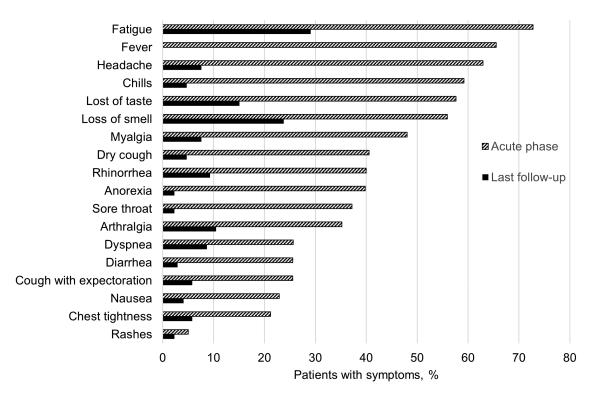


Figure 1. Prevalence of COVID-19 symptoms (percentages) during the acute phase (white/black) and at last follow-up (black bars) in patients with COVID-19 from the first wave in the Faroe Islands (n = 180). Abbreviation: COVID-19, coronavirus disease 2019.

of the most prevalent diseases (hypertension, asthma, hyper-cholesterolemia, or type 2 diabetes) (data not shown).

# **DISCUSSION**

In this study, we followed 180 individuals after recovery from active COVID-19 for the assessment of long COVID. In the study population, 53.1% reported persistence of at least 1 symptom after a mean of 125 days—in particular, fatigue, loss of smell and taste, and arthralgia. Most studies to date have focused on symptom duration and clinical outcomes in adults hospitalized with severe COVID-19 [4, 5, 8, 9]. Our results show that it might take months for symptoms to resolve, and for patients to return to normal health, even among nonhospitalized patients. More than half of the participants reported symptoms for a period of 125 days after active disease, with variable severity; 8.9% reported severe persistent symptoms. Further, analyzing paired data revealed that loss of smell and fatigue were the symptoms that most patients reported both during the acute COVID-19 phase and the last follow-up.

An Italian study (N = 147) assessed persistent symptoms in patients discharged from hospital after recovery from COVID-19 and found that, after a mean of 60.3 days, 87.4% reported the persistence of at least 1 symptom, particularly fatigue and dyspnea [4]. In our study sample the occurrence of persistent symptoms is somewhat lower (53.1%), which might be

expected due to longer follow-up and since our sample represents all COVID-19 disease courses (ie, mild, moderate, severe disease) and only 8 hospitalized patients. Another longitudinal study from China (N = 538) reported that 49.6% of recovered patients who had been hospitalized had 1 or more common symptoms, including physical decline, fatigue, and myalgia, 3 months after discharge [5]. This result is more in line with our estimate of 53.1%, although our study almost entirely included nonhospitalized patients. Thus, our results reveal that long COVID with variable severity occurs in a high proportion of individuals affected by COVID-19, even among those with mild disease courses in the acute phase.

No gender difference was observed in the prevalence of acute or long-term symptoms, and similarly, symptom occurrence did not vary according to pre-existing chronic disease, smoking status, or medication use. This stands somewhat in contrast to other studies [5] but may reflect differences in the study samples. Our study sample consisted of relatively young patients with COVID-19 with generally mild courses. On the other hand, low statistical power might explain that we were not able to substantiate any differences according to sex or morbidity.

Age, however, seems to play a role in symptom presentation. Middle-aged individuals seem most affected in the acute phase, with the highest occurrence of presenting with symptoms, the highest mean number of symptoms, and the highest frequency

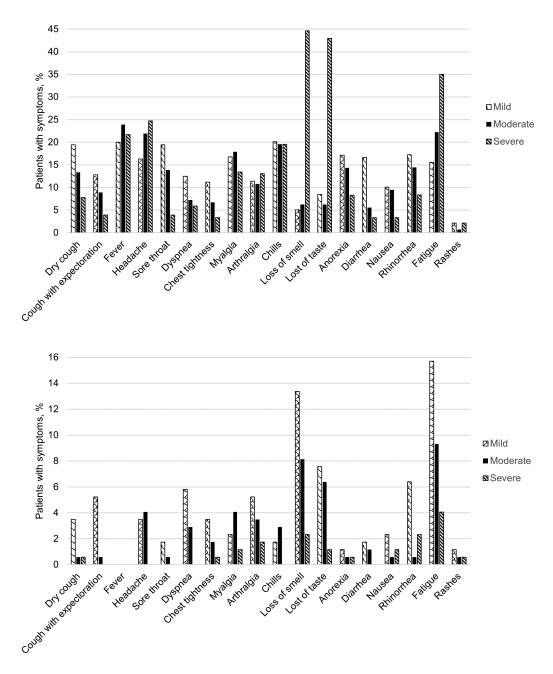


Figure 2. Prevalence of self-reported severity (mild, moderate, and severe) of COVID-19 symptoms during the acute phase (upper panel) and at last follow-up (lower panel) in patients with COVID-19 from the first wave in the Faroe Islands. Abbreviation: COVID-19, coronavirus disease 2019.

Table 3. Paired Data on the Most Prevalent Symptoms (Loss of Smell, Loss Of Taste, Fatigue And Headache) Among Faroese Patients With COVID-19 Symptoms Acute Phase and Last Follow-up

	Loss of Smell, n (%) <sup>a</sup>	Loss of Taste, n (%) <sup>a</sup>	Fatigue, n (%)	Headache, n (%) <sup>b</sup>
No symptoms at acute phase or last follow-up	75 (42.4)	72 (40.7)	47 (26.1)	64 (36.0)
No symptoms at acute phase but at baseline	3 (1.7)	3 (1.7)	2 (1.1)	0
Symptoms at acute phase but not last follow-up	56 (31.6)	73 (41.2)	88 (48.9)	101 (56.7)
Symptoms at acute phase and at last follow-up	43 (24.3)	29 (16.4)	43 (23.9)	13 (7.3)

Abbreviation: COVID-19, coronavirus disease 2019.

<sup>&</sup>lt;sup>a</sup>n = 177

<sup>&</sup>lt;sup>b</sup>n = 178.

of severe symptoms (Supplementary Figure 3). However, in the post–COVID-19 period, a tendency of relatively more persistent symptoms with increasing age was observed. The difference between the proportion reporting any symptom diminished with age, from a 51% reduction among the youngest age group to 17% among the oldest. Thus, the symptoms, although at a lower prevalence, seem to be more persistent among the oldest age group.

Studies from other countries have shown varying proportions of asymptomatic patients ranging from 7% to 52% [10-13]. During the acute phase, 11.2% reported to be asymptomatic (M.F. Kristiansen, B. H. Heimustovu, S. á Borg, T. H. Mohr, H. Gislason, L. F. Møller, D. H. Christiansen, B. á Steig, M. S. Petersen, M. Strøm, S. Gaini, unpublished manuscript, 2020), while our retrospective assessment found that only 4.4%, in fact, were asymptomatic. The lower percentage of asymptomatic individuals can be explained by a more thorough questionnaire at the follow-up than during the acute phase, leading to a higher likelihood of reporting some symptoms in patients with milder disease. The list of symptoms was expanded in this project as new knowledge emerged regarding possible COVID-19-related symptoms. Another explanation of the differing proportion of asymptomatic patients between this study and other studies might be misclassification of symptoms in previous reports for example, categorizing patients with COVID-19 as asymptomatic patients when they actually were presymptomatic.

The study has several strengths. It was a population-based study including 96% of all Faroese patients with COVID-19 from the first outbreak, careful recording of symptoms with follow-up performed by medical doctors in a standardized manner to monitor long COVID, and a high participation rate, limiting any selection bias of patients with more or less severe disease. Compared with other studies that have looked at hospitalized patients, we consider it a strength that our study includes almost entirely nonhospitalized patients (ie, the most common course of COVID-19) with mild, moderate, and severe disease course. However, there are some limitations including lack of information on medical history before acute COVID-19 illness and a lack of objective assessment of symptom severity. However, the participants were given the possibility to rate their symptoms as none, mild, moderate, or severe. The symptoms and severity are self-reported, which may have led to both under- and overestimation and recall bias may also have occurred. However, due to the public awareness around COVID-19, recall bias may have posed less of a problem in later interviews.

## **Conclusions**

Our results show it might take months for symptoms to resolve, even among nonhospitalized persons with a milder illness course in the acute phase. The most persistent symptoms reported were fatigue, loss of smell and taste, and arthralgia. Studying the symptoms of COVID-19 and long COVID is critical for understanding the full natural history of the disease, accurately predicting the disease's cumulative impact beyond hospitalization, and mortality, and continued monitoring for long COVID is needed. Our results highlight the need to quantify long COVID properly and accurately to create better guidance on how to improve investigation in patients with enduring symptoms. To further study long COVID in Faroese patients, a comprehensive medical assessment with detailed history and physical examination is now offered to all study participants.

## **Supplementary Data**

Supplementary materials are available at *Clinical Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

#### Notes

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**Potential conflicts of interest.** The authors: No reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest.

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