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# Symptoms Experienced at the Acute Phase of SARS-CoV-2 Infection as Risk Factor of Long-term Post-COVID Symptoms: The LONG-COVID-EXP-CM Multicenter Study



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# ABSTRACT

*Objective:* This multicenter study investigated clinical risk factors associated with the number of long-term symptoms after COVID.

*Methods:* Clinical features, symptoms at hospital admission, hospitalization data, and the number of symptoms after COVID was systematically assessed for patients who recovered from COVID-19 in 4 hospitals in Madrid (Spain) from February 20 to May 31, 2020.

*Results*: Overall, 1,969 patients (46.5% women, age: 61, SD: 16 years) were randomly assessed 8.4 months (SD 1.5) after hospital discharge. Female gender (odds ratio [OR] 1.82, 95% confidence interval [CI] 1.57-2.10), number of morbidities (OR 1.182, 95% CI 1.08-1.29), number of symptoms at hospital admission (OR 1.309, 95% CI 1.15-1.49) and days at the hospital (OR 1.01, 95% CI 1.007-1.017) were associated (all, p < 0.001) with more long-term symptoms after COVID. Further, vomiting (OR 1.78, 95% CI 1.26-2.52), throat pain (OR 1.36, 95% CI 1.02-1.81), diarrhea (OR 1.51, 95% CI 1.25-1.82), dyspnea (OR 1.20, 95% CI 1.28-1.75) as symptoms at hospital admission were also associated (all, p < 0.01) with a higher number of symptoms after COVID.

*Conclusion:* This multicenter study found that a higher number of symptoms at hospital admission were the most relevant risk factor for developing more symptoms after COVID, supporting the assumption that a higher symptom load at the acute phase is associated with a greater likelihood of long-term symptoms after COVID.

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#### Introduction

The presence of symptoms after COVID range from 35% to 60% (Fernández-de-las-Peñas et al., 2021). Identification of risk factors is needed for early monitoring of individuals at a high risk of developing symptoms after COVID, yet present data are still limited (lqbal et al., 2021). Potential identified risk factors described in former literature include female gender, more onset symptoms (higher symptom load), older age, longer hospital stay, and a

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higher number of co-morbidities (Yong et al., 2021). Nevertheless, contradictory results are also observed between studies. Further, most of the studies included samples of <300 patients and were recruited from single centers (lqbal et al., 2021). A study including a large number of COVID-19 patients reported a prevalence of long-term sick leave from work of 5.8% (Jacobs et al., 2021). These authors found that female gender, older age, and co-morbid medical conditions were significantly associated with long-term sick leave (Jacobs et al., 2021). We describe here a large multicenter study investigating clinical risk factors related to hospitalization associated with the number of long-term symptoms after COVID in a large population sample.

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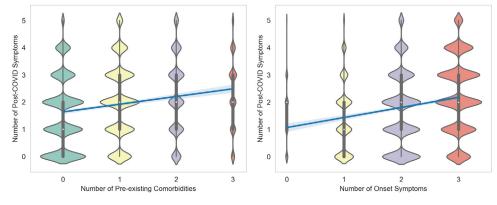


Figure. Positive associations between the number of long-term symptoms after COVID with the number of pre-existing co-morbidities (left) or the number of COVID-19 onset symptoms at hospital admission

#### Methods

The LONG-COVID-EXP-CM is a multicenter cohort study including individuals hospitalized with a diagnosis of SARS-CoV-2 during the first wave of the pandemic in 5 public hospitals in Madrid (Spain). A sample of 400 individuals from each hospital was randomly selected. All Local Ethics Committees approved the study (HCSC20/495E, HSO25112020, HUFA 20/126, HUIL/092-20, HUF/EC1517). Informed consent was obtained from all participants. Participants were scheduled for a telephone interview conducted by experienced healthcare professionals, were systematically asked about a list of symptoms after COVID (multiple symptoms could be selected by the same patient), but were free to report any additional symptom that they experienced at the time of the study. Clinical data (i.e., gender, age, height, weight, comorbidities), COVID-19 symptoms at hospital admission, and hospitalization (i.e., days at hospital, intensive care unit admission) data were collected from medical records.

Mean and SD or percentages were calculated. Missing values were imputed using median imputation. Multivariate logistic regressions were conducted to analyze associations between clinical and hospitalization variables with the number of symptoms after COVID (dependent variable) using Python library statsmodels 0.11.1. Adjusted odds ratio (OR) and confidence intervals (95% CI) were calculated.

# Results

From 2,000 patients randomly selected and invited to participate, a total of 1,969 (46.5% women, age: 61, SD: 16 years) participated. The most prevalent symptoms at hospital admission were fever (74.6%), dyspnea (31.5%), and myalgia (30.7%). Almost 57.5% of the individuals (n = 1,133) reported at least one co-morbidity. Participants were assessed 8.4 months (SD 1.5) after hospital discharge. Almost 1 out of 5 patients (n = 367, 18.7%) were free of symptoms after COVID, whereas 34.4% (n = 679) experienced  $\geq$ 3 symptoms after COVID. The mean number of symptoms after COVID was 1.9 (SD 1.4). The most frequent long-term symptoms after COVID included fatigue (61.3%) and dyspnea (23.3%).

Female gender (OR 1.82, 95% CI 1.57-2.10), number of COVID-19 symptoms at hospital admission (OR 1.309, 95% CI 1.15-1.49), number of pre-existing medical co-morbidities (OR 1.182, 95% CI 1.08-1.29), and days at hospital (OR 1.01, 95% CI 1.007-1.017) were independently associated (all, p <0.001) with more long-term symptoms after COVID: the higher the number of COVID-19 onset symptoms or the higher the number of co-morbidities, the higher the number of symptoms after COVID (**Figure**). No specific co-morbidity (e.g., obesity, hypertension) was associated with a greater number of symptoms after COVID. Some specific symptoms at the acute phase were also independently associated (all, p < 0.01) with a higher number of long-term symptoms after COVID (**Table**): vomiting (OR 1.78, 95% CI 1.26-2.52), throat pain (OR 1.36, 95% CI 1.02-1.81), diarrhea (OR 1.51, 95% CI 1.25-1.82), dyspnea (OR 1.20, 95% CI 1.01-1.41), or headache (OR 1.50, 95% CI 1.28-1.75).

#### Discussion

This multicenter study found that female gender, a greater number of symptoms at hospital admission, a greater number of pre-existing medical co-morbidities, and a longer stay at the hospital were risk factors for developing more long-term symptoms after COVID. In all these risk factors, it seems that a higher number of symptoms at hospital admission was the most relevant for developing more symptoms after COVID. The presence of some specific symptoms at hospital admission such as vomiting, throat pain, diarrhea, dyspnea, or headache was also associated with long-term symptoms after COVID. No specific medical co-morbidity was associated with a greater number of long-term symptoms after COVID. Our data support previous assumptions that a higher symptom load at the acute phase is associated with a greater likelihood of long-term symptoms after COVID (Iqbal et al., 2021; Yong, 2021). The role of previous medical co-morbidities as a risk factor for symptoms after COVID needs further studies. We also observed that the female gender was a potential risk factor for symptoms after COVID, in agreement with previous assumptions (Iqbal et al., 2021). Specific studies investigating gender differences are needed.

Our results should be considered according to some potential weaknesses. First of all, only hospitalized patients participated. Second, we did not collect objective data on COVID-19 disease. Third, the cross-sectional design did not permit the determination of cause-and-effect associations.

#### **Author Contributions**

Dr Fernández-de-las-Peñas and Dr. Palacios-Ceña had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Concept and design: All authors. Drafting of the manuscript: All authors. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Dr. Pellicer-Valero. Supervision: Dr. Martín-Guerrero

#### **Declaration of interests**

No conflict of interest is declared by any of the authors

Table Clinical/Hospitalization Data and Symptoms after COVID (n = 1,969)

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Number of medical co-morbidities, n (%)   86 (42.5%)     None   86 (42.5%)     None   715 (36.3%)     Yavo   281 (14.2%)     3 or more   137 (78)     Medical co-morbidities   137 (78)     Hypertension   514 (26.1%)     Diabetes   236 (12.0%)     Cardiovascular Disease   234 (11.9%)     Asma   126 (6.4%)     Obesity   88 (4.5%)     Chronic Obstructive Pulmonary Disease   31 (1.6%)     Other (Cancer, Kidney Disease)   311 (1.6%)     Strade   312 (16.9%)     Other (Cancer, Kidney Disease)   323 (16.9%)     Strad at the hospital, mean (5D), days   113 (1.4%)     Intensive Care Unit (ICU) admission   112     Ves/No. n (%)   30 (6.6%) / 1.1     Number of long-term symptoms after COVID, n (%)   30 (6.6%) / 1.1     Number of long-term symptoms after COVID, n (%)   120 (6.1.3%)     None   1206 (6.1.3%)     Dyspnoea   459 (23.3%)     Long Term symptoms after COVID, n (%)   120 (6.1.3%)     None   120 (6.1.3%)	Ageusia	66 (33.5%)
None   336 (42.5x) (75 (36.33)     Two   281 (14.28)     3 or more   137 (73)     Medical co-morbidities   137 (73)     Hypertension   514 (26.18)     Diabetes   236 (12.08)     Cardiovascular Disease   234 (11.98)     Asma   236 (6.28)     Obesity   88 (4.53)     Chronic Obstructive Pulmonary Disease   77 (3.98)     Stroke   36 (2.08)     Rheumatological Disease   32 (16.98)     Other (Cancer, Kidney Disease)   32 (16.98)     Stroke   32 (16.98)     Intensive Care Unit (1CU) admission   32 (16.98)     YeyNo, n (%)   130 (66.67) (1.3)     Number of long-term symptoms after COVID, n (%)   36 (2.218)     None   67 (18.78)     None   36 (2.18)     Jo ar more   120 (61.38)     Syspneca   459 (23.33)     Loss memory   346 (21.13)     Stin Rashes   189 (95.83)     Loss memory   36 (2.12)     Stin Rashes   140 (7.13)     Stin Rashes	/omiting	55 (2.8%)
One115 (58.30) 281 (14.28)Two281 (14.28)3 or more131 (28.18)Medical co-morbidities141 (28.18)Uppertension141 (26.18)Cardiovascular Disease236 (12.08)Cardiovascular Disease236 (12.08)Asma126 (6.48)Obesity88 (4.53)Chronic Obstructive Pulmonary Disease77 (3.98)Stroke88 (24.58)Chronic Obstructive Pulmonary Disease31 (1.68)Stroke81 (1.68)Rheumatological Disease32 (16.98)Stray at the hospital, mean (SD), days130 (6.63) / 1.1Other Cancer, Kidney Disease)367 (18.78)Stray at the hospital, mean (SD), days130 (6.63) / 1.1Intensive Care Unit (ICU) admission100 (6.63) / 1.1Vember of long-term symptoms after COVID, n (%)367 (18.78)None367 (18.78)One367 (18.78)Cong-term symptoms after COVID, n (%)369 (23.38)Tog-ferm symptoms after COVID, n (%)369 (23.38)Log-term symptoms after COVID, n (%)12.06 (61.38)Strin Rashes12.06 (61.38)Dyspnoea140 (7.18)Gastrointerstinal Disorders130 (6.59)Anosmia36 (2.78)Triture Asile39 (25.80)Vitterion Disorders31 (27.80)Arbeat49 (2.58)Voiter Poblems90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)V	Number of medical co-morbidities, n (%)	
One115 (58.30) 281 (14.28)Two281 (14.28)3 or more131 (28.18)Medical co-morbidities141 (28.18)Uppertension141 (26.18)Cardiovascular Disease236 (12.08)Cardiovascular Disease236 (12.08)Asma126 (6.48)Obesity88 (4.53)Chronic Obstructive Pulmonary Disease77 (3.98)Stroke88 (24.58)Chronic Obstructive Pulmonary Disease31 (1.68)Stroke81 (1.68)Rheumatological Disease32 (16.98)Stray at the hospital, mean (SD), days130 (6.63) / 1.1Other Cancer, Kidney Disease)367 (18.78)Stray at the hospital, mean (SD), days130 (6.63) / 1.1Intensive Care Unit (ICU) admission100 (6.63) / 1.1Vember of long-term symptoms after COVID, n (%)367 (18.78)None367 (18.78)One367 (18.78)Cong-term symptoms after COVID, n (%)369 (23.38)Tog-ferm symptoms after COVID, n (%)369 (23.38)Log-term symptoms after COVID, n (%)12.06 (61.38)Strin Rashes12.06 (61.38)Dyspnoea140 (7.18)Gastrointerstinal Disorders130 (6.59)Anosmia36 (2.78)Triture Asile39 (25.80)Vitterion Disorders31 (27.80)Arbeat49 (2.58)Voiter Poblems90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)Diarbea90 (25.81)V	None	836 (42.5%)
Two   281 (1422)     3 or more   137 (78)     Medical co-morbidities   137 (78)     Hypertension   514 (26.18)     Diabetes   236 (12.08)     Cardiovascular Disease   234 (11.98)     Asma   236 (6.48)     Obesity   88 (4.58)     Chronic Obstructive Pulmonary Disease   77 (3.98)     Stroke   88 (2.08)     Rheumatological Disease   31 (1.68)     Other (Cancer, Kidney Disease)   312 (16.98)     Stay at the hospital, mean (SD), days   113 (11.4)     Intensive Care Unit (ICU) admission   130 (6.68.) / 1.3     Yes/No. n (%)   130 (6.68.) / 1.4     None   367 (18.78)     One   436 (2.21.8)     Yoo   436 (2.21.8)     Yoo   436 (2.21.8)     Dyspnoea   459 (3.33.0)     Loss memory   459 (23.33.0)     Stin Rashes   236 (10.20.8)     Starin fog   140 (7.13.2)     Palpitations   140 (7.13.2)     Palpitations   140 (7.13.2)     Palpitations	Die	
3 or more   137 (7%)     Medical co-morbidities   144 (26.1%)     Pupertension   236 (12.0%)     Cardiovascular Disease   236 (12.0%)     Asma   126 (6.4%)     Obesity   88 (4.5%)     Chronic Obstructive Pulmonary Disease   77 (3.9%)     Stroke   88 (2.0%)     Rheumatological Disease   77 (3.9%)     Stroke   38 (2.0%)     Rheumatological Disease   73 (3.9%)     Stroke   38 (2.0%)     Stroke (Cancer, Kidney Disease)   322 (16.9%)     Stay at the hospital, mean (SD), days   113 (1.6%)     Intensive Care Unit (ICU) admission   (93.4%)     Yes/No, n (%)   (93.4%)     None   367 (18.7%)     One   436 (22.1%)     None   1206 (61.3%)     Jysponea   458 (24.8%)     Jor more   1206 (61.3%)     Logs ferm symptoms after COVID, n (%)   1206 (61.3%)     Stin Rashes   236 (12.0%)     Starity   1206 (61.3%)     Dysponea   1206 (61.3%)     Starity		
Medical co-morbidities   514 (26.13, 1)     Hypertension   514 (26.13, 2)     Diabetes   236 (12.08)     Cardiovascular Disease   234 (11.98)     Asma   234 (11.98)     Obesity   88 (4.58)     Chronic Obstructive Pulmonary Disease   77 (3.93, 13)     Stroke   77 (3.93, 13)     Chronic Obstructive Pulmonary Disease   77 (3.93, 13)     Stroke   38 (2.08)     Rheumatological Disease   312 (16.93)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   130 (6.62, 1/ 1, 10.8)     Ves/No. n (%)   130 (6.62, 1/ 1, 10.8)     Number of long-term symptoms after COVID, n (%)   130 (6.62, 1/ 1, 10.8)     None   367 (18.78)     One   367 (18.78)     One   367 (18.78)     Stay at the cospital, mean (SD, days   130 (6.62, 1/ 1, 10.8)     None   367 (18.78)     One   367 (18.78)     One   367 (18.78)     Stay at the cospital, mean (SD, days   130 (6.78, 17)     Number of long-term symptoms after COVID,		
Hypertension514 (26.1%)Diabetes236 (12.0%)Cardiovascular Disease234 (11.9%)Asma126 (6.4%)Obesity88 (4.5%)Chronic Obstructive Pulmonary Disease77 (3.9%)Stroke88 (2.0%)Rheumatological Disease31 (1.6%)Other (Cancer, Kidney Disease)322 (16.9%)Stay at the hospital, mean (SD), days113 (11.4)Intensive Care Unit (ICU) admission130 (6.6%) / 11,Yes/No, n (%)130 (6.6%) / 12,None367 (18.7%)One367 (18.7%)One367 (18.7%)One367 (18.7%)One367 (18.7%)Dyspnosa after COVID, n (%)120 (6.13%)Two367 (18.7%)One367 (18.7%)One367 (18.7%)One367 (18.7%)One367 (18.7%)One367 (18.7%)Dyspnosa140 (7.1%)Fatigue1206 (61.3%)Dyspnosa348 (24.8%)Loss memory348 (24.8%)Stin Rashes349 (17.3%)Brain fog140 (7.1%)Attention Disorders140 (7.1%)Attention Disorders36 (27.8%)Anosmia30 (27.8%)Attention Disorders39 (27.8%)Ovice Problems39 (28.9%)Cortoret Symptom at Hospital Admission39 (28.9%)NumberInfo-sterns39 (27.8%)Dyspnosa (n=620)21.5%)31.1%)No Dyspnose (n=620)21.5%)31.5%) <td></td> <td>137 (7%)</td>		137 (7%)
Date236 (12.02)Cardiovascular Disease234 (11.93)Asma126 (6.4%)Obesiry88 (4.5%)Chronic Obstructive Pulmonary Disease77 (398)Stroke38 (2.0%)Rheumatological Disease312 (1.6%)Other (Cancer, Kidney Disease)312 (1.6%)Stay at the hospital, mean (SD), days11.3 (11.4)Intensive Care Unit (ICU) admission130 (6.6%) / 1.1Werst of long-term symptoms after COVID, n (%)130 (6.6%) / 1.1None0367 (18.7%)One367 (18.7%)One367 (18.7%)One486 (24.8%)3 or more486 (24.8%)Jorgener symptoms after COVID, n (%)1206 (61.3%)Tatigue1.206 (61.3%)Dyspneea459 (23.3%)Loss memory341 (17.3%)Skin Rashes236 (12.0%)Brain fog140 (7.1%)Attention Disorders140 (7.1%)Gastrointestinal Disorders140 (7.1%)Jourders140 (7.1%)Aussina50 (25.5%)Diartheat50 (25.5%) </td <td></td> <td>514 (26 1%)</td>		514 (26 1%)
Cardiovascular Disease   234 (11.92)     Asma   126 (6.42)     Obesity   88 (4.53)     Chronic Obstructive Pulmonary Disease   77 (3.93)     Stroke   88 (2.08)     Rheumatological Disease   31 (1.63)     Other (Cancer, Kidney Disease)   322 (16.98)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   (93.66.%) / 1.1     Yes/No, n (%)   (93.66.%) / 1.1     None   367 (18.7%)     One   436 (22.1%)     None   677 (18.7%)     One   436 (22.1%)     Two   436 (22.1%)     Sor more   1206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Sin Rashes   130 (6.7%)     Sor more   1206 (61.3%)     Ocular/Vision		
Asma 126 (6.4%)   Obesity 88 (4.5%)   Obesity 88 (4.5%)   Stroke 38 (2.0%)   Stroke 31 (1.6%)   Other (Cancer, Kidney Disease) 312 (1.6%)   Stay at the hospital, mean (SD), days 11.3 (11.4)   Intensive Care Unit (ICU) admission 130 (6.6%) / 1.4   Yes/No, n (%) 130 (6.6%) / 1.4   None 367 (18.7%)   None 367 (18.7%)   None 367 (18.7%)   Two 366 (22.1%)   Two 436 (22.1%)   None 436 (22.1%)   Long-Term symptoms after COVID, n (%) 1206 (61.3%)   Long-Term symptoms after COVID, n (%) 1206 (61.3%)   Long-Term symptoms after COVID, n (%) 1206 (61.3%)   Skin Rashes 1206 (61.3%)   Joss memory 341 (17.3%)   Skin Rashes 236 (12.0%)   Brain fog 140 (7.1%)   Castiontestinal Disorders 140 (7.1%)   Altention Disorders 133 (6.7%)   Coular/Wision Disorders 39 (2.5%)   Diarthea 50 (2.5%)   Diarthea <td></td> <td></td>		
Obesity   88 (4.5%)     Chronic Obstructive Pulmonary Disease   77 (3.9%)     Stroke   38 (2.0%)     Rheumatological Disease   31 (1.6%)     Other (Cancer, Kidney Disease)   332 (16.9%)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   130 (6.6%) / 1, (93.4%)     Number of long-term symptoms after COVID, n (%)   (93.4%)     None   367 (18.7%)     One   436 (22.1%)     Yavo   488 (24.8%)     3 or more   436 (22.1%)     Yavo   488 (24.8%)     S or more   1206 (61.3%)     Long-Term symptoms after COVID, n (%)   1206 (61.3%)     Long-Term symptoms after COVID, n (%)   1206 (61.3%)     Long-Term symptoms after COVID, n (%)   130 (5.6%)     Long-Term symptoms after COVID, n (%)   132 (5.7%)     Dyspnoea   149 (7.1%)     Patigue   1206 (61.3%)     Justin Bashes   313 (6.7%)     Coular/Vision Disorders   133 (6.7%)     Coular/Vision Disorders   133 (6.7%)     Coular/Vision Disorders		
Chronic Obstructive Pulmonary Disease 77 (3.9%)   Stroke 38 (2.0%)   Rheumatological Disease 31 (1.6%)   Other (Cancer, Kidney Disease) 322 (16.9%)   Stay at the hospital, mean (SD), days 11.3 (11.4)   Intensive Care Unit (ICU) admission 120 (6.6%) / 1.4   Yes/No, n (%) 130 (6.6%) / 1.4   Number of long-term symptoms after COVID, n (%) 367 (18.7%)   None 367 (18.7%)   One 367 (18.7%)   One 488 (24.8%)   3 or more 468 (24.8%)   1 Cong-Term symptoms after COVID, n (%) 488 (24.8%)   String Ear Symptoms after COVID, n (%) 1206 (61.3%)   Dyspnoea 1.206 (61.3%)   Dyspnoea 1.206 (61.3%)   String Ear Symptoms after COVID, n (%) 1206 (61.3%)   String Ear Symptoms after COVID, n (%) 1206 (61.3%)   Dyspnoea 1206 (61.3%)   Outer Problems 130 (6.7%)   Curvid Printo Disorders 140		
Stroke   38 (2.0%)     Rheumatological Disease   31 (1.6%)     Other (Cancer, Kidney Disease)   332 (16.9%)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   130 (6.6%) / 1.3     Yes/No, n (%)   (93.4%)     Number of long-term symptoms after COVID, n (%)   (93.4%)     None   367 (18.7%)     One   436 (22.1%)     Two   436 (22.1%)     Two   436 (22.1%)     Two   436 (23.3%)     Jorne   679 (34.4%)     Long-Term symptoms after COVID, n (%)   (44.5%)     Fatigue   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashees   236 (12.0%)     Brain fog   140 (7.1%)     Castrointestinal Disorders   133 (6.7%)     Cultr/Vision Disorders   133 (6.7%)     Anosmia   80 (4%)     Ageusia   50 (2.55%)     Diarrhea   49 (2.5%)     Diarrhea   49 (2.5%)     Diarrhea	Desity	88 (4.5%)
Rheumatological Disease   31 (1.6%)     Other (Cancer, Kidney Disease)   332 (16.9%)     Stay at the hospital, mean (SD), days   133 (16.6%)     Intensive Care Unit (ICU) admission   130 (6.6%) / 11, (93.4%)     Number of long-term symptoms after COVID, n (%)   (93.4%)     Number of long-term symptoms after COVID, n (%)   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   1206 (61.3%)     Patigue   1.206 (61.3%)     Joss nemory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   439 (23.3%)     Ocular/Vision Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Coular/Vision Disorders   133 (6.7%)     Ocular/Vision Disorders   36 (2.5%)     Diarthea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Sin (2.5%)     Number Long-term Symptomes after COVID, 16(50, 1.3)   Number Long-term Symptoms after COVID     Nonee   2.1 (SD 1.3)	Chronic Obstructive Pulmonary Disease	77 (3.9%)
Rheumatological Disease   31 (1.6%)     Other (Cancer, Kidney Disease)   332 (16.9%)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   130 (6.6%) / 1.4     Yes/No, n (%)   130 (6.6%) / 1.4     Number of long-term symptoms after COVID, n (%)   367 (18.7%)     None   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   436 (22.1%)     Dug-Term symptoms after COVID, n (%)   488 (24.8%)     Partice   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   140 (7.1%)     Castrointestinal Disorders   140 (7.1%)     Altention Disorders   133 (6.7%)     Ocular/Vision Disorders   36 (2.5%)     Disarin fog   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   53 (2.5%)     Disorders   39 (2%)     Covidar/Vision Disorders   39 (2%)     Disorders   39 (2%)	Stroke	38 (2.0%)
Other (Cancer, Kidney Disease)   332 (16.9%)     Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   330 (6.6%) / 1.4     Yes/No, n (%)   300 (6.6%) / 1.4     Number of long-term symptoms after COVID, n (%)   367 (18.7%)     None   367 (18.7%)     One   436 (22.1%)     Two   438 (24.8%)     3 or more   679 (34.4%)     Long-term symptoms after COVID, n (%)   1206 (61.3%)     Long-term symptoms after COVID, n (%)   1206 (61.3%)     Long-term symptoms after COVID, n (%)   1206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (10.0%)     Brain fog   189 (95.5%)     Attention Disorders   140 (7.1%)     Gastrointestinal Disorders   30 (4%)     Angeusia   30 (4%)     Ageusia   313 (6.7%)     Ocular/Vision Disorders   30 (2.5%)     Jarnetea   40 (2.5%)     Voice Problems   30 (2.5%)     Diarrhea   49 (2.5%)	Rheumatological Disease	
Stay at the hospital, mean (SD), days   11.3 (11.4)     Intensive Care Unit (ICU) admission   (30, 66.8) / 1.1, (93.4%)     Ves/No, n (%)   (30, 66.8) / 1.1, (93.4%)     Number of long-term symptoms after COVID, n (%)   (36.7, (18.7%)     None   367 (18.7%)     One   436 (22.1%)     Two   438 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   12.066 (61.3%)     Patigue   1,206 (61.3%)     Josp more   12.06 (61.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   140 (7.1%)     Palpitations   140 (7.1%)     Coular/Vision Disorders   140 (7.1%)     Qualizioni Lison ders   133 (6.7%)     Ocular/Vision Disorders   133 (5.7%)     Ocular/Vision Disorders   133 (5.7%)     Voice Problems   39 (2.5%)     No Dyspnoc	Other (Cancer, Kidney Disease)	
Intensive Care Unit (ICU) admission   130 (6.6%) / 1.4 (93.4%)     Yes/No, n (%)   130 (6.6%) / 1.4 (93.4%)     Number of long-term symptoms after COVID, n (%)   (93.4%)     None   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   488 (24.8%)     Long-Term symptoms after COVID, n (%)   7     Fatigue   1,206 (61.3%)     Joyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (95.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   133 (6.7%)     Ocular/Vision Disorders   133 (6.7%)     Ocular/Vision Disorders   16 (5.9%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   50 (2.55%)     Diarrhea   50 (2.5%) <td< td=""><td></td><td></td></td<>		
Yes/No, n (%) 130 (6.6%) / 1.4   Number of long-term symptoms after COVID, n (%) 367 (18.7%)   None 367 (18.7%)   One 436 (22.1%)   Two 436 (22.1%)   Two 438 (24.8%)   3 or more 679 (34.4%)   Long-Term symptoms after COVID, n (%) 12.06 (61.3%)   Pyspnoea 12.06 (61.3%)   Dyspnoea 459 (23.3%)   Loss memory 341 (17.3%)   Skin Rashes 236 (12.0%)   Brain fog 140 (7.1%)   Attention Disorders 140 (7.1%)   Gastrointestinal Disorders 140 (7.1%)   Ageusia 133 (6.7%)   Ocular/Vision Disorders 113 (6.5%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Toyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1.349) 8.1 (SD 1.4)		11.5 (11.1)
Number of long-term symptoms after COVID, n (%)   (93.4%)     None   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   1,206 (61.3%)     Patigue   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Palpitations   140 (7.1%)     Quality/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after COVID     Typspnoea (n=620)   21 (5D 1.3)     No Dyspnoea (n=1,349)   18 (5D 1.4)		120 (6 6%) / 1 820
Number of long-term symptoms after COVID, n (%)   367 (18.7%)     None   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   1206 (61.3%)     Paysnoea   459 (23.3%)     Dyspnoea   459 (23.3%)     Dyspnoea   459 (23.3%)     Skin Rashes   236 (12.0%)     Brain fog   341 (17.3%)     Attention Disorders   140 (7.1%)     Pajtitions   140 (7.1%)     Gastrointestinal Disorders   140 (7.1%)     Collar/Vision Disorders   133 (6.7%)     Ocular/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   50 (2.5%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Outgo-terolems   20 (2.5%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     Dyspnoea (n=620)	res/no, n (%)	
None   367 (18.7%)     One   436 (22.1%)     Two   488 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   1.206 (61.3%)     Fatigue   1.206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Gastrointestinal Disorders   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   139 (2.5%)     Voice Problems   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     CovID-19 Onset Symptom at Hospital Admission   Number Long-term     Symptoma (n=620)	Number of long term sumptoms after COVID_n (%)	(95.4%)
One   436 (22.1%)     Two   436 (22.1%)     Two   488 (24.8%)     3 or more   679 (34.4%)     Long-Term symptoms after COVID, n (%)   1,206 (61.3%)     Patigue   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   140 (7.1%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Opspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		267 (10 7%)
Two   488 (24.8%)     3 or more   679 (34.4%)     Log-Term symptoms after COVID, n (%)   1,206 (61.3%)     Fatigue   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Diarrhea   49 (2.5%)     Voice Problems   59 (23.5%)     Oct/IP-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after COVID-19 Onset (n=620)     No Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
3 or more 679 (34.4%)   Long-Term symptoms after COVID, n (%) 1,206 (61.3%)   Fatigue 1,206 (61.3%)   Dyspnoea 459 (23.3%)   Loss memory 341 (17.3%)   Skin Rashes 236 (12.0%)   Brain fog 189 (9.5%)   Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Diarrhea 99 (2.5%)   Voice Problems 99 (2.5%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Ovylpspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 18 (SD 1.4)		
Long-Term symptoms after COVID, n (%)   1,206 (61.3%)     Fatigue   1,206 (61.3%)     Dyspnoea   459 (23.3%)     Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Obyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
Fatigue 1,206 (61.3%)   Dyspnoea 459 (23.3%)   Loss memory 341 (17.3%)   Skin Rashes 236 (12.0%)   Brain fog 189 (9.5%)   Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)	3 or more	679 (34.4%)
Dyspnoea 459 (23.3%)   Loss memory 341 (17.3%)   Skin Rashes 236 (12.0%)   Brain fog 189 (9.5%)   Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 140 (7.1%)   Ocular/Vision Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Opspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)	.ong-Term symptoms after COVID, n (%)	
Loss memory   341 (17.3%)     Skin Rashes   236 (12.0%)     Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   133 (6.7%)     Ocular/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Opspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)	Fatigue	1,206 (61.3%)
Skin Rashes 236 (12.0%)   Brain fog 189 (9.5%)   Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)	Dyspnoea	459 (23.3%)
Brain fog   189 (9.5%)     Attention Disorders   140 (7.1%)     Palpitations   140 (7.1%)     Gastrointestinal Disorders   133 (6.7%)     Ocular/Vision Disorders   133 (6.7%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number Long-term     Symptomea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)	Loss memory	341 (17.3%)
Brain fog 189 (9.5%)   Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoma functional function functional functional functional functional functional	skin Rashes	236 (12.0%)
Attention Disorders 140 (7.1%)   Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)	Brain fog	
Palpitations 140 (7.1%)   Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Diarrhea 50 (2.55%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)		, ,
Gastrointestinal Disorders 133 (6.7%)   Ocular/Vision Disorders 116 (5.9%)   Anosmia 80 (4%)   Ageusia 53 (2.7%)   Throat Pain 50 (2.55%)   Diarrhea 49 (2.5%)   Voice Problems 39 (2%)   COVID-19 Onset Symptom at Hospital Admission Number   Long-term Symptoms after   Output COVID   Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)		
Ocular/Vision Disorders   116 (5.9%)     Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Opspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)	1	
Anosmia   80 (4%)     Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Supprove (n=620)     * Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		, ,
Ageusia   53 (2.7%)     Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number Long-term     * Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
Throat Pain   50 (2.55%)     Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number Long-term     Symptoms after Symptoms after COVID   Symptoms after COVID     * Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
Diarrhea   49 (2.5%)     Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number Long-term Symptoms after COVID     * Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
Voice Problems   39 (2%)     COVID-19 Onset Symptom at Hospital Admission   Number     Long-term   Symptoms after     Symptoms (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		
COVID-19 Onset Symptom at Hospital AdmissionNumber Long-term Symptoms after COVID*Dyspnoea (n=620)2.1 (SD 1.3)No Dyspnoea (n=1,349)1.8 (SD 1.4)		
Long-term     Symptoms after     *Dyspnoea (n=620)     No Dyspnoea (n=1,349)     1.8 (SD 1.4)	/oice Problems	39 (2%)
Symptoms after     *Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)	COVID-19 Onset Symptom at Hospital Admission	Number
COVID     *Dyspnoea (n=620)   2.1 (SD 1.3)     No Dyspnoea (n=1,349)   1.8 (SD 1.4)		Long-term
*Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)		Symptoms after
*Dyspnoea (n=620) 2.1 (SD 1.3)   No Dyspnoea (n=1,349) 1.8 (SD 1.4)		• •
No Dyspnoea (n=1,349) 1.8 (SD 1.4)	Dyspace (n=620)	
11eductie (11=552) 2.2 (5D 1.4)		
No Headacha (n. 1637) 19 (6D 12)		
No Headache (n=1,637) 1.8 (SD 1.3)		
*Diarrhea (n=210) 2.25 (SD 1.4)		
No Diarrhea (n=1,759) 1.8 (SD 1.4)		
*Throat Pain (n=102) 2.35 (SD 1.4)		. ,
No Throat Pain (n=1,867) 1.85 (SD 1.4)	No Throat Pain (n=1,867)	1.85 (SD 1.4)
*Vomiting (n=55) 2.5 (SD 1.4)	Vomiting (n=55)	2.5 (SD 1.4)
No Vomiting (n=1,914) 1.85 (SD 1.3)	No Vomiting (n=1,914)	1.85 (SD 1.3)

\* Significant association in the multivariate analysis

# Acknowledgments

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