

## Independent predictors of long-COVID in patients without comorbidities. Data from the Polish long-COVID cardiovascular (PoLoCOV-CVD) study

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Coronavirus disease 2019 (COVID-19) is a serious respiratory disease that results from infection with a newly discovered coronavirus (SARS-CoV-2). Patients recovering from SARS-CoV-2 infection complain of persisting symptoms which may lead to chronic fatigue syndrome and as well as many other complications. The vast majority of COVID-19 patients remaining in isolation/quarantine, due to the mild course of the disease, do not require hospitalization. There are many studies describing the course and complications of patients hospitalized due to COVID-19. There is little published data on how nonhospitalized patients get sick and what are the early and late complications of SARS-CoV-2 infection. Little is also known about Long-COVID (LC) in patients without comorbidities. Therefore, the aim of our analysis was to assess the predictors of long-lasting symptoms in patients without comorbidities suffering from COVID-19.

**Methods:** Patients  $\geq 18$  years of age diagnosed with COVID-19, were examined after full recovery (resolution of clinical symptoms, minimum 14 days after last symptoms). Patient information, course of the disease with symptoms, post-COVID-19 complaints were collected within 4–8 weeks after the COVID-19 recovery. We followed patients for at least 3 months. Patients were ordered the following tests: 12-lead ECG, 24-hour Holter ECG monitoring, 24-hour Holter blood pressure monitoring, Echocardiographic of the Heart assessment, Biochemical tests: lipid profile, glucose or glycosylated hemoglobin level, D-dimers. In patients with indications, the follow-

ing were additionally performed: Magnetic resonance imaging of the heart, Computed tomography angiography (CTA) of pulmonary vessels, Angio CT of coronary vessels or other diagnostic tests.

**Results:** We identified 701 consecutive patients without comorbidities of whom 488 pts completed 3 month follow-up. Comparisons were made between LC group (n=218) and non-LC group (n=270). The demographic and laboratory characteristics of the studied group are presented in Table 1. Patients with severe course of acute phase of COVID-19 developed LC more often (72 vs. 28%,  $p < 0.001$ ). Significant differences regarding sex, weight, height, body mass index were observed. Patients with LC more often presented with dyspnoea, significant fatigue, chest pain, leg muscle pain, headache, arthralgia and chills. No statistically significant difference was observed regarding laboratory tests, 24-hour systolic and diastolic BP and echocardiographic parameters. LC group had higher 24-hour heart rate (77 [72–83] vs. 75 [70–81],  $p = 0.021$ ). Multivariate regression analysis showed that LC patients had higher BMI (odds ratio 1.057, 95% confidence intervals 1.016–1.100) and almost twice as often had a severe course (1.736, 1.071–2.814) and presented with arthralgia in the acute phase (1.901, 1.225–2.950).

**Conclusions:** Severe course of COVID-19, BMI, and arthralgia are independently related to long-COVID in patients without comorbidities.

Table 1. Differences between groups with and without Long COVID among patients without comorbidities

	Long COVID (n=218)	No long COVID (n=270)	p	Total (n=488)
<b>Clinical characteristics</b>				
Age	46.03 $\pm$ 11.88	44.30 $\pm$ 12.82	0.126	45 $\pm$ 12
Women	69.14%	55.96%	0.003	308 (63%)
Men	30.86%	44.01%	0.003	179 (37%)
Weight [kg]	82 (68-95)	72 (63-85)	0.000	78 (65-90)
Height [cm]	171 (164-176)	167 (161-173)	0.001	168 (163-176)
Body Mass Index [kg/m <sup>2</sup> ]	28 (24-31)	26 (23-30)	0.000	26.2 (23.7-30.8)
Vaccine against flu last year	3.17%	1.67%	0.502	11 (2.55%)
<b>The course of COVID-19</b>				
Symptomatic course of COVID-19 (yes)	98.82%	96.34%	0.154	435 (97.75%)
Home isolation	91.39%	92.45%	0.671	440 (91.86%)
Hospitalization without pneumonia	1.57%	2.15%	0.928	4 (2.15%)
Hospitalization with pneumonia	5.81%	6.42%	0.793	27 (6.07%)
Hospitalization with ICU	0.78%	0.54%	0.783	3 (0.68%)
Pneumonia COVID-19	3.91%	2.70%	0.789	15 (3.40%)
Severe course (hospital or home isolation)	34.22%	18.62%	0.000	125 (27.72%)
<b>Symptoms during COVID-19</b>				
Temperature $< 36.6$ C deg.	12.20%	16.58%	0.192	62 (14.06%)
Temperature $\geq 36.6$ and $< 37.5$ C deg.	26.56%	27.46%	0.832	121 (26.95%)
Temperature $\geq 37.5$ C deg.	51.15%	53.61%	0.603	238 (52.19%)
Cough	60.08%	54.26%	0.219	257 (57.62%)
Dyspnoea	48.26%	32.62%	0.001	186 (41.70%)
Upper respiratory tract infection/rhinitis	27.06%	30.48%	0.431	126 (28.51%)
Influenza-like symptoms	47.06%	41.18%	0.219	197 (44.57%)
Anosmia	9.88%	12.37%	0.410	48 (10.93%)
Ageusia	5.53%	5.98%	0.843	25 (5.72%)
Anosmia or ageusia	52.51%	48.45%	0.393	230 (50.77%)
Significant fatigue	72.27%	62.89%	0.034	307 (68.22%)
Chest pain	50.20%	35.87%	0.003	194 (44.19%)
Back muscle pain	54.15%	47.40%	0.158	228 (51.24%)
Leg muscle pain	40.87%	31.72%	0.050	162 (36.99%)
Headache	66.27%	52.36%	0.003	269 (60.31%)
Arthralgia	43.65%	24.46%	0.000	155 (35.55%)
Diarrhoea	21.74%	18.92%	0.471	90 (20.55%)
Vomiting	7.54%	5.43%	0.384	29 (6.65%)
Chills	33.60%	24.46%	0.039	130 (29.75%)
BP elevation or dysregulation of previously well-controlled BP	8.73%	6.49%	0.387	34 (7.78%)
Impaired hearing	5.95%	4.89%	0.631	24 (5.50%)
Sum of symptoms	5 (2-8)	2 (1-5)	0.000	4 (2-6)