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Functioning of patients with post-COVID syndrome — preliminary data

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ABSTRACT

Introduction: Post-COVID syndrome is a common finding during the first year after SARS-CoV-2 infection affecting the daily living of many patients.

The aim of this study was to assess the functioning of patients with post-COVID syndrome.

Material and methods: A self-reported questionnaire — the Functioning in Chronic Illness Scale (FCIS) — was applied in 79 (30 women, 49 men) patients (mean age of 62.7 ± 13.6 years), suffering from post-COVID syndrome 5.8 ± 2.3 months after discharge from hospital.

Results: The mean FCIS score was 86.2 ± 12.8 points, corresponding to medium functioning level. The mean score in the first, second and third subscale was 27.0 ± 6.4; 27.5 ± 3.7; and 31.7 ± 4.3 points respectively. Better functioning was observed in men vs women: the FCIS score 88.59 ± 10.95 vs 82.20 ± 14.71; p = 0.02 and in the youngest patients: first (< 59 years) vs second (59–67 years) vs third tercile (> 67 years): FCIS score 92.76 ± 14.84 vs 83.15 ± 11.64 vs 83.07 ± 9.68; p = 0.01. The amount of time from COVID-19-related hospitalisation did not affect the FCIS score.

Conclusion: Symptoms of post-COVID syndrome influencing patients' functioning persist within the first year regardless of the time elapsing from the disease. Men and younger patients demonstrate better functioning abilities.

Key words: functioning of patients, FCIS, post-COVID syndrome

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Introduction

A substantial proportion of COVID-19 survivors persistently complain of symptoms or development of new symptoms related to SARS-CoV-2 infection [1, 2]. Most of the patients experience at least one symptom during their convalescence. The clinical presentation of post-COVID syndrome is heterogeneous [3, 4]. The most common symptoms are fatigue, dyspnoea, chest pain, joint pain, palpitations, anosmia and dysgeusia, hair loss, cognitive symptoms (memory and attention deficits) and psychosocial distress (loneliness, anxiety, depression and sleep disorders) [4]. Moreover, the symptoms may persist, fluctuate, or appear and be replaced by other symptoms, strongly influencing functioning of patients and requiring dedicated rehabilitation [5]. Post-COVID syndrome meets criteria for a chronic disease according to the World Health Organization

(WHO) and U.S. National Center for Health Statistics (USNCHS) [6, 7]. WHO states that chronic diseases are of long duration, generally slow progression and show no person-to-person transmission [6]. According to the USNCHS definition, chronic diseases last at least 3 months, cannot generally be prevented by vaccines or cured by medication, nor do they just disappear [7]. Therefore, for the assessment of the functioning of patients with post-COVID syndrome we applied the Functioning in Chronic Illness Scale (FCIS).

Material and methods

The self-reported FCIS questionnaire was applied in 79 patients suffering from post-COVID syndrome. Patient characteristics are presented in Table 1. The FCIS has been designed to evaluate the impact of

the disease on the patient, the patient's impact on the disease and the impact of the disease on patient attitudes [8, 9]. This tool allows comprehensive assessment of physical and mental functioning in chronic diseases. This self-reported questionnaire consists of 24 questions divided into 3 subscales. The value of the a-Cronbach coefficient for the entire questionnaire is 0.855, indicating its reliability and homogeneity. The value of the determinant of the correlation matrix was 0.001, K-M-O parameter was 0.843 and the Bartlett's test of sphericity was statistically significant [10–13]. Answers for each questionnaire question are graded 1 to 5 points. The maximal score is 120 points. For each section of the questionnaire, the maximal score is 40 points. The score of less than 79 points for the entire questionnaire indicates low functioning, 79–93 points — medium functioning and > 93 points — high functioning [12]. In the first subscale evaluating the impact of the disease on the patient, scores < 23 points indicate low level, 24–33 — medium level and > 34 points — high level of functioning. The respective scoring categories for the second subscale assessing the patient's impact on the disease, are: < 24 points, 25–29 points and > 30 points. The impact of the disease on patient attitudes is evaluated in the third subscale, where the score intervals for low, medium and high functioning are: < 27 points, 28–33 points, and > 33 points [12].

Results of the FCIS were analysed according to patients' gender, age and time from hospitalisation due to COVID-19.

Statistics

Statistical analysis was carried out using the Statistica 13.0 package (TIBCO Software Inc., Palo Alto, California, USA). Continuous variables were presented as means with standard deviations, medians with interquartile range, minimum and maximum value. The Shapiro–Wilk test demonstrated non-normal distribution of the investigated continuous variables. Therefore, non-parametric tests were used. Comparisons between 2 groups were performed with the Mann–Whitney unpaired rank sum test. For comparisons between 3 or more groups, the Kruskal–Wallis one-way analysis of variance and multiple comparison test were used. Results were considered significant at p-value < 0.05.

Results

The mean FCIS score obtained in 79 patients was 86.2 ± 12.8 points, corresponding to medium functioning level (Tab. 1). The mean scores obtained in the first (impact of the disease on the patient), second (patient impact on the disease) and third (impact of the disease on patient attitudes) subscales were 27.0 ± 6.4; 27.5 ± 3.7, and 31.7 ± 4.3 points respectively. Of note, as many as 50 (63.3%) patients, referring to the first statement of the first part of the FCIS (My physical capacity is similar as prior to the illness), answered "definitely NOT" (n = 19) or "rather not" (n = 31). Referring to the

Table 1. Patients' characteristics and the FCIS results

Parameter		All patients	
		N-value	**% / SD**
Gender	Female	30	38%
	Male	49	62%
Age	Years	62.7	13.6
Time from COVID-19	Months	5.8	2.3
FCIS total score	Low level	18	22.8%
	Medium level	37	46.8%
	High level	24	30.4%
FCIS 1st subscale score	Low level	21	26.6%
	Medium level	42	53.2%
	High level	16	20.3%
FCIS 2nd subscale score	Low level	16	20.3%
	Medium level	40	50.6%
	High level	23	29.1%
FCIS 3rd subscale score	Low level	13	16.5%
	Medium level	40	50.6%
	High level	26	32.9%

Table 2. The FCIS results according to gender

| FCIS	Gender	FCIS score								P-value
		N	Mean	SD	ME	Q1	Q3	Min	Max	
Total score	Male	49	88.59	10.95	86.00	81.00	99.00	65.00	109.0	0.0204
	Female	30	82.20	14.71	79.50	72.00	95.00	57.00	111.0	
1st subscale	Male	49	27.90	5.99	28.00	25.00	32.00	14.00	38.00	0.0854
	Female	30	25.50	6.94	24.50	21.00	31.00	11.00	38.00	
2nd subscale	Male	49	27.90	3.38	28.00	25.00	30.00	21.00	35.00	0.2414
	Female	30	26.93	4.25	26.50	24.00	30.00	18.00	36.00	
3rd subscale	Male	49	32.80	3.59	33.00	30.00	36.00	27.00	40.00	0.0042
	Female	30	29.77	4.76	29.00	27.00	33.00	23.00	37.00	
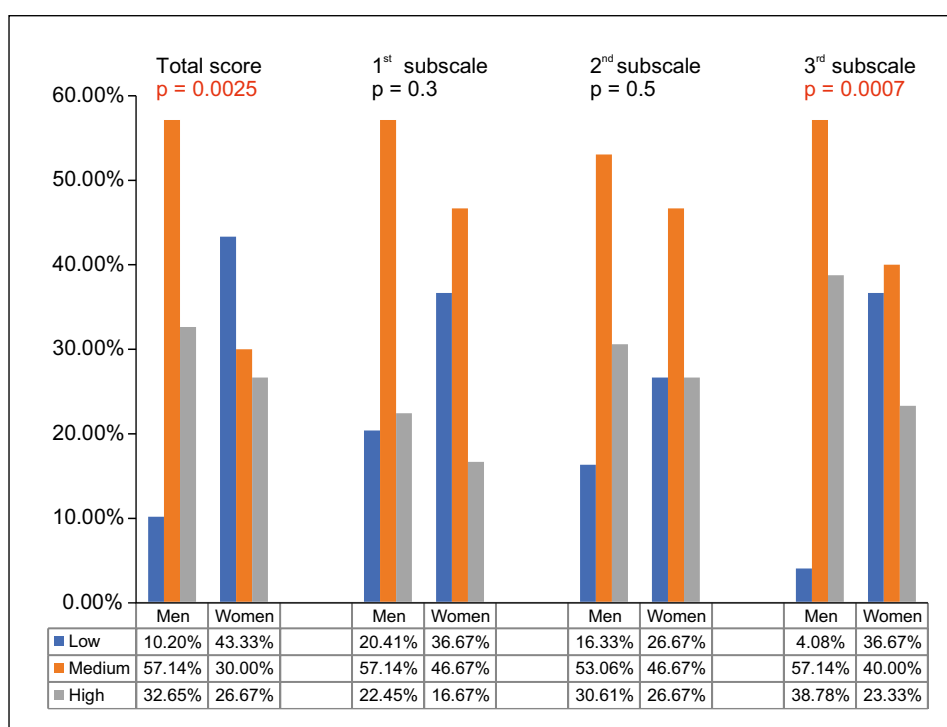
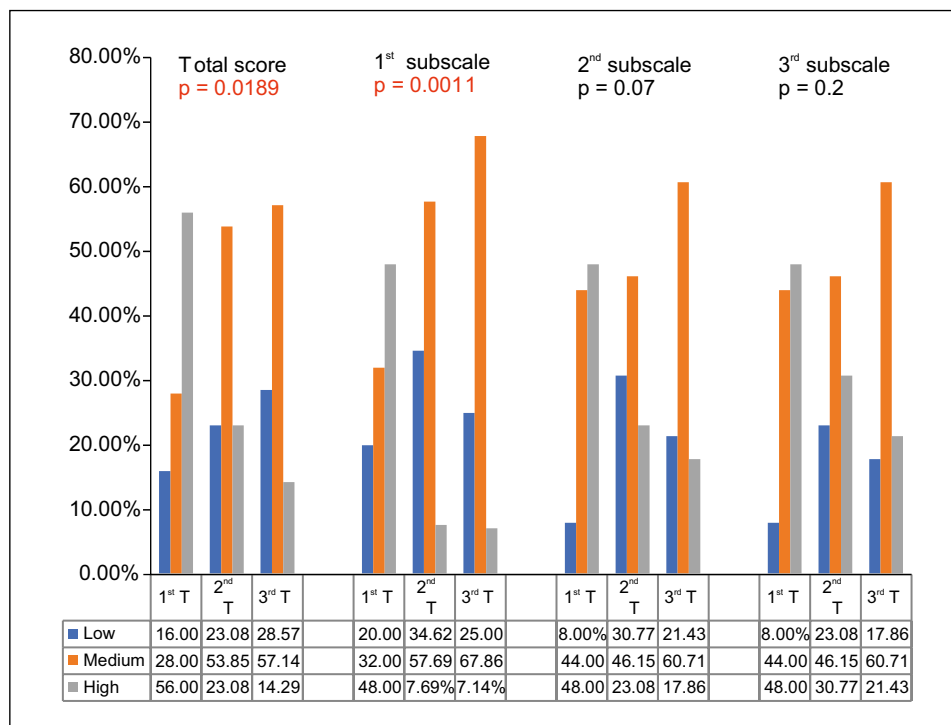Figure 1. The prevalence of low, medium and high levels of FCIS score according to gender

other statement of the second part of the questionnaire (I am primarily responsible for my future well-/ill-being) a vast majority of patients (n = 59; 74.7%) answered "rather yes" (n = 38); "definitely YES" (n = 21). It also needs to be highlighted that referring to the first statement of the last part of the questionnaire (My illness made me actively take care of my health) 67 (84.8%) patients rendered a positive answer, choosing the "rather yes" (n = 38) or "definitely YES" (n = 29) option.

Men demonstrated higher levels of functioning than women, with significant differences in the total FCIS score and in the third subscale (Tab. 2). Consequently, the prevalence of low levels of FCIS score was significantly higher in women, while medium and high level scores were more common in men (p = 0.0007). This was mainly driven by the differences observed in the third subscale (Fig. 1). A substantial impact of age on the functioning level of patients with post-COVID syndrome was also noted. Higher FCIS scores were acquired in the youngest subset of patients (first tercile: < 59 years), compared with the second (59–67 years) and third tercile (> 67 years) (Tab. 3), with a significant difference between the first and the second tercile (p = 0.0372) and between the first and the third tercile (p = 0.0323). This was reflected by adequate prevalence of low,

Table 3. The FCIS results according to age

FCIS	Age	FCIS score								P-value
		N	Mean	SD	ME	Q1	Q3	Min	Max	
Total score	1st tertiary	25	92.76	14.84	99.00	80.00	105.00	59.00	111.00	0.0149
	2nd tertiary	26	83.15	11.64	82.00	78.00	92.00	60.00	103.00	
	3rd tertiary	28	83.07	9.68	83.50	77.00	89.00	57,00	100.00	
1st subscale	1st tertiary	25	29.84	7.85	32.00	25.00	36.00	11.00	38.00	0.0167
	2nd tertiary	26	25.69	6.03	26.00	22.00	30.00	14.00	35.00	
	3rd tertiary	28	25.64	4.47	25.00	23.50	28.00	16.00	36.00	
2nd subscale	1st tertiary	25	29.68	3.79	29.00	27.00	33.00	23.00	36.00	0.0071
	2nd tertiary	26	26.54	3.22	27.00	24.00	29.00	20.00	32.00	
	3rd tertiary	28	26.54	3.43	26.50	25.00	29.00	18.00	35.00	
3rd subscale	1st tertiary	25	33.24	4.74	33.00	30.00	37.00	23.00	40.00	0.0581
	2nd tertiary	26	30.92	4.30	30.50	28.00	36.00	23.00	38.00	
	3rd tertiary	28	30.89	3.61	30.50	28.00	33.00	23.00	38.00	

Figure 2. The prevalence of low, medium and high levels of FCIS score according to age

medium and high levels of FCIS score in subsets of patients divided according to age (Fig. 2). The difference in the total FCIS score (p = 0.0189) was mainly influenced by the result of the first subscale (p = 0.0011). Contrary to gender and age, the time from COVID-19-related hospitalisation did not affect the FCIS score (Tab. 4).

Discussion

According to our best knowledge, this is the first report using the FCIS questionnaire in a post-COVID-19 population. While a significant impact of gender and age on the functioning of patients with post-COVID syndrome could be observed, no such

Table 4. The FCIS results according to the time from hospitalization due to COVID-19

FCIS	Age	FCIS score								P-value
		N	Mean	SD	ME	Q1	Q3	Min	Max	
Total score	1st tertiary	15	84.73	11.40	81.00	76.00	93.00	70.00	111.00	0.7316
	2nd tertiary	29	85.76	13.06	83.00	80.00	96.00	59.00	107.00	
	3rd tertiary	35	87.11	13.43	85.00	78.00	100.0	57.00	109.00	
1st subscale	1st tertiary	15	26.60	6.60	27.00	24.00	31.00	14.00	38.00	0.9916
	2nd tertiary	29	26.93	6.50	28.00	23.00	32.00	11.00	36.00	
	3rd tertiary	35	27.20	6.48	26.00	23.00	32.00	15.00	38.00	
2nd subscale	1st tertiary	15	27.13	3.78	27.00	25.00	29.00	21.00	36.00	0.8665
	2nd tertiary	29	27.55	4.05	28.00	25.00	30.00	20.00	35.00	
	3rd tertiary	35	27.69	3.55	27.00	26.00	30.00	18.00	36.00	
3rd subscale	1st tertiary	15	31.00	3.76	31.00	28.00	33.00	23.00	37.00	0.6048
	2nd tertiary	29	31.28	4.22	31.00	28.00	36.00	23.00	37.00	
	3rd tertiary	35	32.23	4.62	32.00	29.00	36.00	23.00	40.00	

relation was demonstrated for the time elapsing from COVID-19-related hospitalisation. We have demonstrated strong influence of post-COVID syndrome on the daily living of a majority of patients, as after 6 months since acute SARS-CoV-2 infection, the FCIS score was high only in 30% of patients. Almost 80% of survey participants obtained low or medium score in the first subscale. This result suggests a significant impact of the disease on physical and mental functioning. According to the result of the second subscale, 29% of patients believe that they have a significant impact on the course of illness, while 20% negate this possibility. Furthermore, according to the result of the third subscale, 33% of responders hold a very optimistic view for the future, while 16% remain pessimistic. Our functional assessment suggests that a vast majority of patients suffering from post-COVID syndrome need urgent and dedicated rehabilitation providing both a physical and mental coverage. Our results are in line with some previous studies showing severe impairments in physical functioning and during activities of daily living in post-COVID-19 patients [14–16]. In a large study assessing 1733 post-COVID-19 patients 6 months after discharge from hospital, more then 60% of survivors reported fatigue or muscle weakness, sleep difficulties, and anxiety or depression [16]. Patients with a more severe in-hospital course of COVID-19 had more severe impairment of pulmonary diffusion capacities and abnormal chest imaging manifestations. These patients are indicated in literature as the main target population for intervention [16, 17]. As shown in this preliminary report, due to the variety of symptoms of post-COVID syndrome, a personalised approach is indispensable. An experienced physician should assess the patient, and after thorough assessment of the patient's clinical condition, a dedicated intervention should be set up in collaboration with the rehabilitation team [17]. We have demonstrated a stronger impact of post-COVID syndrome on patient functional status in females than in males. The difference was mainly driven by the evaluation of the impact of the disease on patient attitudes (the third FCIS subscale). Men were significantly more optimistic regarding their future than women. We have also demonstrated better functional status in the youngest patients (< 59 years). We found a significant difference in the first and second FCIS subscales reflecting patient's believes respectively regarding the impact of post-COVID syndrome on their lives, and the possibility of influencing the course of the disease. Long-term persistence of symptoms was confirmed by similar FCIS results irrespective of the time from hospitalisation due to COVID-19.

An integrated, comprehensive rehabilitation programme is recommended for post-COVID patients, involving a multidisciplinary and multi-professional team providing neuromuscular, cardiac, respiratory, and swallowing interventions, and psychological support, in order to improve patients' quality of life [14, 17]. Similarly to other chronic diseases, rehabilitation should be complemented by patient education and strengthening of patient motivation [11, 18–22]. We are convinced that, despite the logistic difficulties related to the epidemiological situation, education of patients should be initiated before discharge from hospital [23, 24]. A personalised approach to rehabilitation often requires pharmacological support, mainly due to frequent comorbidities. Therefore, monitoring of adherence to medication is also an important issue in this specific subset of patients [25–33]. The results of this preliminary

report were used to plan a personalised rehabilitation programme for patients with post-COVID syndrome. We are going to assess the effectiveness of our rehabilitation programme with comprehensive assessment of patient functional status using the FCIS, both before and after the rehabilitation.

The main limitations of this study are the small number of assessed patients and the limited number of factors that could influence the FCIS score.

Conclusion

Symptoms of post-COVID syndrome influencing patient functioning persist within the first year regardless of the time elapsing from the disease. Better functioning was observed in men and younger patients.

Conflict of interest: *None.*

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