Depression and anxiety in patients recently recovered from coronavirus disease (COVID-19)

Objawy depresji i lęku u pacjentów po przebyciu choroby koronawirusowej (COVID-19)

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A b s t r a c t

Aim of the study: To evaluate the presence and severity of anxiety and depressive symptoms in patients who recently recovered from coronavirus disease 2019 (COVID-19).
Material and methods: In this cross-sectional observational study, patients who had recovered from COVID-19 were assessed between February and April 2021. The symptoms reported by patients were evaluated using a questionnaire developed by the authors based on the National Institute for Health and Care Excellence (NICE) guidelines. The Beck Depression Inventory (BDI) and the State-Trait Anxiety Inventory (STAI) were used to assess their depressive symptoms and anxiety.
Results: Of the 102 patients, 45 (44%) were men, and the mean age (± standard deviation – SD) was 52 ±13 years. The mean time interval (±SD) between COVID-19 diagnosis and the examination was 56 ±18 days. Seventy-eight (76%) patients were treated at home, while 24 (23.5%) were hospitalized. Fatigue, cognitive impairment ("brain fog"), breathlessness, and cough were the most frequently reported complaints. Median scores of the BDI, state-anxiety (STAI 1) and trait-anxiety (STAI 2) were 7 (interquartile range, IQR = 10), 38 (IQR = 13), and 40.5 (IQR = 14), respectively. Mild depressive symptoms were observed in almost 30% of patients. Women scored significantly higher than men.
Conclusions: Patients who have recently recovered from COVID-19 show increased anxiety and depressive symptoms, the intensity of which was more pronounced in women. From the clinical perspective, physicians should be aware of the anxiety and depressive symptoms of the post-COVID-19 syndrome.

S t r e s z c z e n i e

Cel pracy: Ocena występowania objawów lęku i depresji w grupie pacjentów, którzy przeszli chorobę koronawirusową (COVID-19).
Materiał i metody: W przekrojowym badaniu obserwacyjnym w okresie od lutego do kwietnia 2021 r. przebadano pacjentów, którzy niedawno przebyli chorobę koronawirusową (COVID-19), co najmniej 28 dni od rozpoznania. Objawy zgłaszane przez pacjentów były oceniane za pomocą kwestionariusza opracowanego na podstawie wytycznych Narodowego Instytutu Doskonałości Zdrowia i Opieki (NICE, Wielka Brytania). Pacjenci byli badani z użyciem *Inwentarza depresji Becka* (*Beck Depression Inventory* – BDI) oraz *Inwentarza stanu i cechy lęku* (State-Trait Anxiety Inventory – STAI) w celu oceny objawów depresji i lęku.
Wyniki: W badanej grupie 102 osób było 45 mężczyzn (44%), średnia wieku (± odchylenie standardowe – SD) wynosiła 52 ±13 lat. Średni czas (±SD), jaki upłynął od diagnozy COVID-19 do badania, wynosił 56 ±18 dni. Spośród 102 ozdrowieńców, 78 (76%) było leczonych w domu, podczas gdy 24 (23,5%) osoby były hospitalizowane. Najczęściej zgłaszanymi dolegliwościami były zmęczenie, zaburzenia funkcji poznawczych („mgła mózgowa"), duszność i kaszel. Mediana wyników dla BDI, lęku jako stanu (STAI 1) i lęku jako cechy (STAI 2) wyniosła odpowiednio 7 (rozstęp kwartylowy, IQR = 10), 38 (IQR = 13) i 40,5 (IQR = 14). Łagodne objawy depresji zaobserwowano u prawie 30% pacjentów. Odnotowano istotnie wyższe wyniki BDI, STAI 1 i STAI 2 u kobiet w porównaniu z mężczyznami.
Wnioski: Pacjenci, którzy niedawno przebyli COVID-19, wykazują zwiększone nasilenie lęku i objawy depresji. Objawy są bardziej wyrażone u kobiet. Z klinicznego punktu widzenia lekarze powinni być świadomi ob-

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Key words: COVID-19, BDI, STAI, anxiety, depression.

jawów depresji i lęku występujących u pacjentów po przechorowaniu COVID-19.

Słowa kluczowe: COVID-19, BDI, STAI, lęk, depresja.

Introduction

Since the outbreak of coronavirus disease 2019 (COVID-19) in December 2019, we have been witnessing the greatest pandemic in recent years. As of May 25, 2021, over 167 million global cases have been reported (Worldometer 2021). COVID-19 is associated with a substantial risk of hospitalization and death (Wang *et al*. 2020). The pandemic created a previously unknown reality symbolized by facemasks, lockdown and social distancing. All these issues significantly affect the psychosocial dimension of life (Torales *et al*. 2020) as well as mental health in the general population (Xiong *et al*. 2020) and vulnerable groups (Suwalska *et al*. 2021; Tasnim *et al*. 2021).

The meta-analysis conducted in 2020 shows that the estimated pooled prevalence of depression increased from 3.44% in 2017 to 25% in 2020 (Bueno-Notivol *et al*. 2021). Moreover, according to a recently published study, 18% of COVID-19 patients developed a psychiatric disorder up to 3 months after their diagnosis (Taquet *et al*. 2021).

Following the acute phase of the disease, COVID-19 may have chronic consequences. Indeed, patients who have recovered from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection may present various sequelae (Al-Aly *et al*. 2021).

Previous studies showed that chronic diseases, such as diabetes mellitus, cancer, or heart disease, are related to higher rates of depression and anxiety (Berge *et al*. 2019; Cohen *et al*. 2019; Pitman *et al*. 2018). At present, however, the severity of anxiety and depression in post-COVID-19 patients remains largely unknown.

The Beck Depression Inventory (BDI) is a well-established tool for assessing depressive symptoms (Beck *et al*. 1961). Likewise, the State-Trait Anxiety Inventory (STAI) is a commonly used instrument for measuring trait and state anxiety (Spielberger *et al*. 1983). Both of these inventories are commonly used when assessing patients with different diseases. The BDI was previously used to assess depressive symptoms in patients with various neurological diseases such as multiple sclerosis and in cancer patients (Cvetkovic and Nenadovic 2016; Tauil *et al*.

2018). The STAI was previously used when assessing anxiety in patients with chronic stroke or suffering from cancer (Chun *et al*. 2017; Eskelinen and Ollonen 2011).

Aim of the study

The present study evaluated the severity of anxiety and depression in patients who had recovered from COVID-19 using the Beck Depression Inventory and State-Trait Anxiety Inventory.

Material and methods

Study design and patients

The study was designed as a single-center, cross-sectional study. This substudy, designed to assess the severity of depression and anxiety, was a part of a more extensive research project evaluating post-COVID-19 sequelae. We defined post-COVID-19 sequelae (or post-acute COVID-19 syndrome) as persistent symptoms and/or delayed or long-term complications of SARS-CoV-2 infection beyond four weeks from the diagnosis of COVID-19 (Nalbandian *et al*. 2021). The examination of patients was conducted in the 2nd Department of Cardiology, St. John Paul II HCP Hospital in Poznan. Primary care physicians in Poznan recruited ambulatory patients who had recently recovered from COVID-19. The reason for referral was the evaluation after the COVID-19 infection. The assessment of patients took place between February 9 and April 16, 2021. Inclusion criteria were as follows: age > 18 years, confirmed COVID-19 infection by SARS-CoV-2 real-time PCR using nasopharyngeal swabs at least 28 days before the assessment. We included patients either treated at home or hospitalized due to COVID-19. We set the following exclusion criteria: severe mental disorders (dementia, schizophrenia, bipolar disorders, schizoaffective disorders), auditory and visual disability. In order to assess post-acute COVID-19 symptoms, we developed a questionnaire based on the National Institute for Health and Care Excellence (NICE) guidelines (NICE 2020). The questionnaire consisted of 24 questions ("yes/no" answers) regarding the current symptoms. Patients completed the questionnaire on their own.

Self-reported symptoms of anxiety

Anxiety was measured with the Polish adaptation of the State-Trait Anxiety Inventory (STAI) (Sosnowski *et al*. 2011). The STAI is a 40-item self-assessment scale measuring the presence and severity of current symptoms of anxiety and a generalized propensity to be anxious. The STAI is divided into two subscales; each of them contains 20 items. First, the State Anxiety Scale (S-Anxiety or STAI 1) evaluates the current state of anxiety, asking how respondents feel "right now". It uses items that measure subjective feelings of apprehension, tension, nervousness, worry, and activation/arousal of the autonomic nervous system. The second subscale – the Trait Anxiety Scale (T-Anxiety or STAI 2) – evaluates relatively stable aspects of "anxiety proneness", including general states of confidence, calmness and security. Responses for the S-Anxiety scale assess the intensity of current feelings "at this moment": 1) not at all, 2) somewhat, 3) moderately so, and 4) very much so. Responses for the T-Anxiety scale assess the frequency of feelings "in general": 1) almost never, 2) sometimes, 3) often, and 4) almost always. The STAI has been used in several chronic medical conditions (Julian 2011).

Assessment of depressive symptoms

We used the Polish adaptation of the Beck Depression Inventory (BDI) (Parnowski and Jernajczyk 1977) to assess depressive symptoms. The BDI is a self-reported, 21-question test for measuring the presence and severity of symptoms of depression in the preceding two weeks. The BDI contains 21 items on a 4-point scale from 0 (*symptom absent*) to 3 (*severe symptoms*). It covers affective, cognitive, somatic and vegetative symptoms of depression, reflecting the criteria for major depression. Higher scores indicate greater symptom severity (Jackson-Koku 2016).

All patients signed informed consent before entering the study. The Bioethics Commission of Poznan University of Medical Sciences approved the study. The study complies with the requirements of the Declaration of Helsinki.

Statistical analysis

The distribution of data was tested for normality using the Shapiro-Wilk test. Continuous data are presented as mean and standard deviation (SD) or median and interquartile range (IQR) when data were non-normally distributed.

Categorical variables are expressed as numbers and percentages. Student's *t*-test or the Mann-Whitney *U*-test was applied for the group comparison. Correlations were evaluated by the Pearson or Spearman correlation coefficient. Statistical significance was considered for values of $p < 0.05$. We performed all analyses using the data analysis software system Statistica, version 13 (TIBCO Software Inc., 2017).

Results

Characteristics of the study group are shown in Table 1. We excluded three patients from the initially included 105 patients: one patient did not complete the STAI questionnaire correctly, one patient had the examination 120 days after COVID-19, and one patient had a BDI result of 41 and was referred to a psychiatrist. Finally, the analyzed group consisted of 102 patients, 55 women (55.9%), with a mean age of 51.9 ±13.4 years. 24 (23.6%) hospitalized patients had moderate to severe COVID-19 disease (Rochwerg *et al*. 2020). However, none of the patients was in a critical stage of COVID-19, requiring admission to the intensive care unit, intubation or heart-lung machine or extracorporeal membrane oxygenation (ECMO) support. The average time (±SD) from the diagnosis of COVID-19 was 55 ±18 days. Table 2 shows the occurrence of post-COVID-19 symptoms. Fatigue (82.4%), cognitive impairment (52.9%),

Table 1. Characteristics of the study group

Variable	
Number of patients	102
Males/females, *n* (%)	45 (44)/57 (56)
Age (years ±SD)	52 ±13
Number of days since COVID-19 diagnosis ±SD	56 ±18
Number of patients hospitalized for COVID-19 (%)	24 (23.5)
Comorbidities, *n* (%)	
Hypertension	37 (36.3)
Hypothyroidism	13 (12.7)
Diabetes mellitus	10 (9.8)
Asthma/chronic obstructive pulmonary disease	8 (7.8)
Dyslipidemia	6 (5.9)
History of depression/anxiety disorders	5 (4.9)
Ischemic heart disease	3 (2.9)

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Table 2. Symptoms after COVID-19 (sorted by frequency)

Symptom	Number of patients (%)
Fatigue	84 (82.4)
Cognitive impairment ("brain fog")	54 (52.9)
Breathlessness	43 (42.2)
Cough	43 (42.2)
Chest tightness	38 (37.3)
Sleep disorders	38 (37.3)
Peripheral neuropathy symptoms	36 (35.3)
Anxiety	34 (33.3)
Palpitations	30 (29.4)
Headache	29 (28.4)
Loss of taste/smell	29 (28.4)
Muscle pain	28 (27.5)
Dizziness	24 (23.5)
Joint pain	23 (22.5)
Chest pain	22 (21.6)
Tinnitus	18 (17.6)
Depressive symptoms	17 (16.7)
Pain	12 (11.8)
Sore throat	11(10.8)
Abdominal pain	9 (8.8)
Skin rashes	8 (7.8)
Diarrhea	7 (6.9)
Earache	4 (3.9)
Nausea	2 (2)

breathlessness (42.2%) and cough (42.2%) were most frequently reported. The median number of the reported symptoms was six (IQR = 6, min = 0, max = 16). Women reported significantly more symptoms than men (8, IQR = 5 vs. 5, IQR = 4, respectively, $p = 0.007$).

BDI and STAI 1 results were non-normally distributed. BDI results were left-skewed; STAI 1 results were slightly right-skewed. The median BDI score for the whole group was 7 (IQR = 10), the median STAI 1 score was 38 (IQR = 13), and the median STAI 2 score was 40.5 (IQR = 14). Women had significantly higher scores of BDI, STAI 1 and STAI 2 (Table 3). Categorized BDI results are shown in Table 4. A BDI score ≤ 11 was observed in 72 (70.6%) patients. In this group, only four patients reported no symptoms suggestive of depression (BDI score = 0). The median score in this group was 5 (IQR = 5). Twenty-nine (28.4%) had a score corresponding to mild depression (BDI score ≥ 12 and ≤ 26), and one patient (1%) had symptoms of moderate to severe depression (BDI score > 26).

BDI, STAI 1 and STAI 2 scores showed high correlation (Table 5, Spearman's $\rho > 0.75$, $p < 0.001$).

There were a moderate correlation between the number of post-COVID-19 symptoms and BDI, STAI 1 and STAI 2 results (Table 6).

Hospitalized patients had significantly higher BDI scores. There was no significant difference regarding STAI 1 and STAI 2 in hospitalized vs. non-hospitalized patients (Table 7).

Discussion

To the best of our knowledge, this is the first study assessing the severity of depression and anxiety in Polish patients who have recovered from COVID-19. Our results show that almost 30% of patients present symptoms related to mild depression (BDI score ≥ 12 and ≤ 26). Moreover, in the group in which the BDI score was below 12, only four patients reported no symptoms. The median score in this group was 5 (IQR = 5). The median BDI score was significantly higher in women (Table 3). This finding corresponds with previous studies before the COVID-19 outbreak. According to a systematic review and meta-analysis of post-COVID-19 symptoms (Lopez-Leon *et al*. 2021), 13% of those patients suffer from depression, and 12% complain of anxiety. In the recently published paper by de Sá Junior *et al*. (2019) women had higher scores of BDI-II than men.

Table 3. BDI, STAI 1 and STAI 2 scores

	All (*N* = 102)	Men (*n* = 45)	Women (*n* = 57)	*p* (men vs. women)
BDI (IQR)	7 (10)	7 (7)	9 (11)	0.046
STAI 1 (IQR)	38 (13)	35 (14)	40 (13)	0.02
STAI 2 (IQR)	40.5 (14)	36 (13)	45 (13)	< 0.01

Table 4. Categorized BDI results

BDI score	Number of patients (%)
≤ 11 (no depression)	72 (70.6)
≥ 12 and ≤ 26 (mild depression)	29 (28.4)
> 26 (moderate-severe depression)	1 (1.0)

Table 5. Correlation between BDI, STAI 1 and STAI 2 scores

Variables	Spearman's ρ	p
BDI and STAI 1 score	0.75	< 0.001
BDI and STAI 2 score	0.80	< 0.001
STAI 1 and STAI 2 score	0.86	< 0.001

Table 6. Correlation between number of symptoms and BDI, STAI 1 and STAI 2 results

Variables	Spearman's ρ	p
Number of symptoms and BDI score	0.47	< 0.001
Number of symptoms and STAI 1 score	0.49	< 0.001
Number of symptoms and STAI 2 score	0.47	< 0.001

Table 7. BDI, STAI 1 and STAI 2 in hospitalized vs. non-hospitalized patients

Inventory type	Non-hospitalized patients (n = 78)	Hospitalized patients (n = 24)	p
BDI (IQR)	6.5 (7)	10.5 (13.5)	0.02
STAI 1 (IQR)	38 (14)	41.5 (18)	0.19
STAI 2 (IQR)	40 (13)	42.5 (16)	0.26

We also found a correlation between the number of symptoms and higher BDI scores. Furthermore, hospitalized patients had higher BDI scores than non-hospitalized ones. These findings could be related to the content of the BDI. Some of the items of the BDI concern the symptoms observed after COVID-19. For example, questions about being annoyed or about difficulties in decision-making can be connected with COVID-19-related neurological changes described as brain fog (Nakamura *et al*. 2021).

The BDI questionnaire concerns issues related to physical problems such as pain, upset stomach, and constipation. Again, all these problems are common three months after being diagnosed with COVID-19 (Al-Aly *et al*. 2021). Differences regarding BDI scores in hospitalized and non-hospitalized patients may reflect the distress resulting from the strict isolation for a long time. Furthermore, many patients feel uncertain about the state of their health and the future.

To evaluate the anxiety level, we used the STAI 1 and STAI 2 inventory. The median STAI 1 score was 38 (IQR = 13), and the median STAI 2 score was 40.5 (IQR = 14). These results indicate that patients had a moderate level of anxiety. The results were similar or even lower than mean results in the population during the COVID-19 pandemic, where the mean result was 50.3 ±7.4 (Madkor *et al*. 2021). Our study showed that females had greater anxiety level than males. Hishinuma *et al*. (2000) also observed such a difference, where female and male students were tested.

The limitation of our study is its cross-sectional design. To assess whether experiencing COVID-19 can affect depression and anxiety level, the study should be prospective. Our study cannot exclude the background increase of anxiety and depression related to the COVID-19 pandemic. A recent study by Solomou and Constantinidou (2020) revealed that during the pandemic, 23.1% of responders reported moderate-to-severe anxiety symptoms. Concerning depression, 48% reported mild and 9.2% moderate-to-severe depression symptoms.

Conclusions

Patients recently recovered from COVID-19 present elevated anxiety and depressive symptoms. In this regard, women are more affected. From the clinical point of view, physicians should be aware of the depressive and anxiety symptoms of the post-COVID-19 syndrome. It is necessary to address (identify and treat) them, minimize the risk of progression to the chronic state, and help re-establish the pre-COVID-19 health status.

Disclosure

The authors declare no conflict of interest.

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