



**APPLICATION OF REFLEXOTHERAPY AND TRADITIONAL ORIENTAL GYMNASTICS AT THE OUTPATIENT STAGE OF REHABILITATION OF PATIENTS AFTER COVID-19 COMPLICATED BY PSYCHONEUROLOGICAL DISORDERS**

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**ANNOTATION**

The article is devoted to the development of individual rehabilitation programs for patients who have undergone COVID-19, complicated by neuropsychiatric disorders, using the methods of exercise therapy, physiotherapy and traditional oriental medicine at the outpatient stage.

**Keywords**

COVID-19, neuropsychiatric disorders, medical rehabilitation, physiotherapy, reflexology, traditional oriental gymnastics

**Relevance.** Initially, COVID-19 was assumed to be an acute infection with complete resolution of mild to moderate forms within 2-3 weeks. However, over time, there is increasing evidence that clinical manifestations can persist for more than 6 months [2, 19, 21, 23]. In September 2020, the International Classification of Diseases, 10th revision, introduced a separate code to describe post-COVID-19 syndrome: "U09.9 - condition after COVID-19" [6, 20]. It turned out that most patients who had a new coronavirus infection needed medical rehabilitation measures.

Currently, there is a situation in the world in which there is insufficient reliable professional information on medical rehabilitation care for patients with COVID-19 because the disease is new. Given the unusual nature of the pandemic situation itself and the specific pathogenesis of the disease caused by SARS-CoV-2, the formulaic use of conventional methods of rehabilitation after respiratory illness may be unsafe or ineffective [8]. Persistent or re-emerging symptoms, and COVID-19-related functional impairment in  $\geq 50\%$  of cases, according to questionnaires and analysis of disease outcomes in hospitals and clinics, negatively affect the quality of life, mobility, and independence of patients seeking medical care [14-18]. Development of individual programs of medical rehabilitation (MR) of patients with the post-COVID-19 syndrome with the use of methods of therapeutic physical



training, physical therapy, reflexotherapy and other non-medicamental methods at the outpatient stage remains a topical problem. At the same time, non-drug methods of MR are aimed at the activation of adaptive reserves of an organism taking into account peculiarities of pathogenesis and clinical manifestations of post-COVID-19.

Medical rehabilitation (MR) of patients with the post-COVID-19 syndrome at the outpatient stage has the following objectives: restoration of cardiorespiratory system functions, alignment of arousal and inhibition processes in the central nervous system (CNS), improvement of psycho-emotional tone and sleep quality, combating muscle pain syndrome, restoration of muscle strength, increasing tolerance to physical exertion [3, 5, 9, 13].

Following the goal set and objectives, the rehabilitation program includes therapeutic exercise (TE) and physical factors with sedative, psychotonic, analgesic, and trophostimulating effects [4, 7, 10, 11, 12].

A promising and relevant direction is the possibility of broader use of methods of traditional oriental medicine: reflexology, manual therapy, and traditional gymnastics (yoga, tai chi, Qigong therapy) [24].

At the present stage, an integrated approach using both empirical provisions of ancient oriental theories, methods of traditional Chinese medicine, and neurophysiological concepts of modern acupuncture, using up-to-date modifications of exposure to acupuncture points, is the most optimal [22, 24].

**The study aimed** to develop a comprehensive rehabilitation program for patients with COVID-19 complicated by neuropsychiatric disorders at the outpatient stage using methods of traditional oriental medicine and evaluate its effectiveness.

**Research methods and materials.** The study was conducted in the Center for Oriental Medicine at the Korean International Cooperation Agency (KOICA) in Uzbekistan and the Republican Clinical Hospital (RCH) No.2, Health Center No.2 in Tashkent. We observed 166 patients with coronavirus infection who had signs of nervous system damage. The patients underwent outpatient rehabilitation in the period 2020-2022, 4 weeks after the end of treatment for the main disease.

The study was characterised as an open, prospective observational research. The study design was meant to include men and women aged 30 to 65 years who were diagnosed with an anxiety disorder (AD) with an anxiety score of at least 17 on the Hamilton Scale. This scale allows the detection of not only affective but also psychosomatic disorders [1]. All patients signed informed consent to participate in the study.



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The multidisciplinary rehabilitation team included a neurologist, a rehabilitologist, a reflexologist, an instructor of physical therapy, a masseur, and a nurse from the physical therapy department.

Depending on the medical rehabilitation program, the patients were divided into 4 groups, comparable with each other in terms of age and sex characteristics and clinical and functional state of the body.

Group I (n=38) consisted of patients who exercised independently at home every day for 10-15 minutes of morning exercises and 30-40 minutes of evening walks.

Group II (n=40) patients received massage and physical therapy procedures (magnetic therapy of the collar zone or pain area) for 10 days.

In Group III (n=42), the rehabilitation program included reflexotherapy procedures.

Group IV (n=46) included patients whose rehabilitation program included reflexotherapy procedures and physical therapy sessions with the elements of traditional oriental gymnastics (qigong, yoga with meditation elements).

Magnetotherapy procedures were conducted on the apparatus "Polyus-1" with the assistance of round inductors or solenoids; the intensity of the alternating magnetic field was 30 mT, 15 minutes per field, after the course of 10 procedures was made according to the classical method.

Reflexotherapy was carried out by acupuncture therapy (Zhen, ART); it is a method of treating diseases by applying acupuncture needles to biologically active points. Several needle insertion techniques were carried out, which provided excitatory, inhibitory, and harmonizing influence techniques, depending on the syndromic acupuncture and clinical diagnoses. The number of needles inserted varied from 5 to 15. The duration of the session ranged from 15 to 60 minutes. The course of treatment was from 10 to 20 sessions.

In the IV observation group, in addition to ART, the patients were engaged in therapeutic gymnastics according to the developed method with the inclusion of elements of traditional oriental gymnastics Qigong and yoga. A sample set of exercises is given in Appendix 1.

The patients underwent a comprehensive examination before the MR program, at the end of the course of procedures, as well as after 1, 3 and 6 months from the beginning of the program. The criteria for the effectiveness of the rehabilitation measures were:

- neurological status;
- visual analogue pain scale (VAS);
- assessment of SpO<sub>2</sub> at rest and during physical activity,
- evaluation of physical activity tolerance according to the Borg Scale,

- assessment of dyspnea on MRC scale (dyspnea),
- assessment of muscle strength on the MRC scale (muscles),
- assessment of the intensity of anxiety and depression on the Hospital Anxiety and Depression Scale (HADS);
- assessment of quality of life according to the results of the European Quality of Life Questionnaire EQ-5 in dynamics.

Statistical data processing was performed using Excel and SPSS application programs. Descriptive statistics criteria were used to characterize the data obtained: arithmetic mean, standard deviation. We assessed the differences in the average indices for the 2 groups using Student's test. The difference was considered statistically significant if  $p < 0.05$ .

**Results and Discussion.** When patients were evaluated at the time of referral to an outpatient health centre, 31% (51 patients) had 1-2 symptoms, and 59% (115 patients) had three or more symptoms. Quality of life deterioration was observed in 45.7% (76 people) of patients. The most frequent symptoms seen one month after COVID-19 infection included: fatigue (65%), insomnia (24%), anxiety and depression (26%), hair loss (23%), anosmia (9%), joint pain (12%), palpitations (11%), decreased appetite (9%), taste disorder (8%), dizziness (5%), diarrhoea and vomiting (3%), chest pain or tightness (7%), sore throat (3%), skin rash (2%), headache (4%), myalgia (4%). The clinical and functional characteristics of patients on admission for MR are shown in Table 1.

Table 1.

Clinical and functional characteristics of patients in all observation groups at the beginning of rehabilitation measures

Parameters	I group (n=38)	II group (n=40)	III group (n=42)	IV group (n=46)
Age	56,6±11,9	45,9±11,8	49,71±11,10	53,86±9,52
BMI, kg/m <sup>2</sup>	26,6±7,9	30,5±5,5	35,5±2,8	36,6±2,9
M/F	13 -F 25-M	20 -F 20-M	22 -F 20-M	27 -F 19-M
Total score on a HADS scale	32,2±2,74	33,2±2,21	31,2±2,98	32,8±2,63
Anxiety	9,82±1,72	6,46±2,37	8,80±1,70	8,82±2,72
Depression	6,46±2,37	9,80±1,70	7,42±1,38	6,24±2,85
Subscale «Insomnia»	2,78±0,52	2,88±0,35	2,65±0,48	2,82±0,62
Subscale «Vegetative disorders»	2,59±0,32	2,54±0,39	2,49±0,79	2,62±0,28
Subscale	2,37±0,87	2,39±0,45	2,41±0,67	2,43±0,39

«Cardiovascular disorders»				
SpO2 at rest	95±2,5	96±2,5	95±2,5	94±2,5
Quality of life according to the EQ-5 questionnaire, points	14,2±2,8	16,4±1,4	13,9±2,5	15,3±3,5
Pain syndrome according to VAS, points	6,46±2,37	7,80±1,70	5,82±1,38	6,24±2,85
Physical activity tolerance according to the Borg Scale	7,0±1,72	8,1±2,37	8,80±1,70	7,82±2,72
Dyspnea on the MRC scale	1,37±0,87	2,39±0,45	2,41±0,67	1,43±0,39
Muscle strength on the MRC scale	4,0±1,5	5±0,5	4,1±1,1	4,7±0,3

In the course of rehabilitation measures, the patients' condition improved in all groups, but to varying degrees.

The total score on the HADS scale decreased in Group I by 26%, in Group II by 39%, in Group III by 37%, and in Group IV by 86%. The severity of anxiety and depression decreased most in the group where patients performed exercises with Qigong, yoga and meditation ( $p < 0,05$ ) against the background of reflexotherapy.

The pain syndrome decreased in the groups using physical factors and reflexotherapy to an equal degree, to the maximum in the group combining reflexotherapy with the developed therapeutic exercises.

The tolerance of physical activity according to the Borg Scale improved in Groups II and III (by 27 % and 24 % respectively), more expressed ( $p < 0,05$ ) in the groups using regular physical activity (by 39 % in Group I and by 51 % in Group IV). By the end of 1 month from the beginning of MR, dyspnea had decreased by 34% in group I and muscle strength on the MRC scale had increased by 33%, 12% and 23% in group II, 19% and 22% in group III, respectively, and most dramatically by 45% and 46% in group IV.

Reduced severity of pain syndrome, dyspnea, anxiety and depression, improved quality of sleep, increased physical performance and muscle strength combined to improve quality of life indicators. Total quality of life on the EQ-5 questionnaire increased by 40% in group I, by 37% in group II, by 39% in group III, and by 67% in group IV.

The dynamics of the clinical and functional indicators of the patients as a result of different rehabilitation treatment programs are shown in Table 2.

Table 2.

Dynamics of clinical and functional indicators of patients of all observation groups during rehabilitation measures

Parameters	I group (n=38)	II group (n=40)	III group (n=42)	IV group (n=46)
Total score on a HADS scale	$\frac{32,2 \pm 2,74}{23,83 \pm 1,97^*}$	$\frac{33,2 \pm 2,21}{20,25 \pm 2,09^*}$	$\frac{31,2 \pm 2,98}{19,65 \pm 1,91^*}$	$\frac{32,8 \pm 2,63}{4,59 \pm 2,13^{**}}$
Anxiety	$\frac{9,82 \pm 1,67}{7,42 \pm 1,06^*}$	$\frac{7,46 \pm 1,37}{4,87 \pm 1,03^*}$	$\frac{8,78 \pm 1,94}{4,18 \pm 0,92^*}$	$\frac{8,82 \pm 1,72}{3,13 \pm 0,65^{**}}$
Depression	$\frac{6,46 \pm 1,37}{4,32 \pm 0,69}$	$\frac{8,80 \pm 1,70}{4,18 \pm 0,65^*}$	$\frac{7,42 \pm 1,38}{3,19 \pm 0,53^*}$	$\frac{6,24 \pm 1,85}{2,38 \pm 0,69^{**}}$
SpO2 at rest	$\frac{95,26 \pm 2,52}{97,87 \pm 2,84}$	$\frac{96,12 \pm 2,85}{98,39 \pm 1,13}$	$\frac{95,79 \pm 2,28}{98,19 \pm 2,89}$	$\frac{94,87 \pm 2,79}{98,86 \pm 1,64^*}$
Quality of life according to the EQ-5 questionnaire, points	$\frac{14,2 \pm 2,8}{19,9 \pm 1,9^*}$	$\frac{16,4 \pm 1,4}{22,6 \pm 0,9^*}$	$\frac{14,9 \pm 2,5}{20,8 \pm 1,8^*}$	$\frac{15,3 \pm 3,5}{25,7 \pm 1,2^{**}}$
Pain syndrome according to VAS, points	$\frac{6,46 \pm 2,37}{4,24 \pm 1,03^*}$	$\frac{7,30 \pm 1,70}{3,85 \pm 1,12^*}$	$\frac{6,82 \pm 1,38}{3,56 \pm 0,98^*}$	$\frac{6,24 \pm 2,85}{2,74 \pm 0,82^{**}}$
Physical activity tolerance according to the Borg Scale	$\frac{7,06 \pm 1,72}{9,85 \pm 1,17^*}$	$\frac{8,14 \pm 2,37}{10,37 \pm 1,93}$	$\frac{8,80 \pm 1,70}{10,92 \pm 1,13}$	$\frac{7,82 \pm 2,72}{11,86 \pm 1,58^{**}}$
Dyspnea on the MRC scale	$\frac{1,97 \pm 0,87}{1,29 \pm 0,38^*}$	$\frac{2,19 \pm 0,45}{1,92 \pm 0,63}$	$\frac{2,31 \pm 0,67}{1,87 \pm 0,59}$	$\frac{2,63 \pm 0,39}{1,44 \pm 0,39^*}$
Muscle strength on the MRC scale	$\frac{4,6 \pm 1,5}{6,2 \pm 1,1}$	$\frac{5,2 \pm 0,5}{6,4 \pm 0,5}$	$\frac{4,8 \pm 1,1}{5,9 \pm 1,2}$	$\frac{4,7 \pm 0,3}{6,9 \pm 0,7^*}$

**Note:** in the numerator - before the beginning of rehabilitation measures, in the denominator - by the end of 1 month from the beginning of rehabilitation.

\* - reliability of differences between the indicators before and after 1 month from the beginning of rehabilitation measures,  $p < 0.05$ .

\*\* - reliability of the differences between the observation groups,  $p < 0.05$ .

The data we obtained are confirmed by the results of Chinese colleagues. The article "Cognition and Thinking about New Coronavirus Pneumonia in Traditional Chinese Medicine" by Chinese scientists notes the important role of Chinese medicine in treating new coronavirus pneumonia (Miao Qing, Cong Xiaodong, Wang Bing, 2020).

PRC regional programs work mainly in three areas, carrying out activities aimed at prevention, treatment and rehabilitation. In the prevention stage, they recommend the use of Yu Ping Feng San (5PM), a powder containing the roots of



medicinal plants. At the stage of rehabilitation, using methods of traditional Chinese medicine, such as Zen-Ju therapy (Zheng Wenke, Zhang Junhua, Yang Fengwen, 2020).

According to the studies of a number of authors, there is a positive effect of the combination of acupuncture and moxibustion. The choice of acupuncture points for the new coronavirus infection COVID-19 is considered based on the principle of "point selection by symptoms". In a study (Cui Hanjin, Wang Wenzhu, Wang Yu, 2020), physicians from the Chinese Acupuncture and Cauterization Association analyzed the symptoms associated with the diagnosis and clinic of COVID-19, developed and proposed certain point combinations. The authors in the article give the following symptomatic point combinations: 14 XIII Dazhui (DU14) and 11 II Quchi (LI11) for fever; 14 XIII Dazhui (DU14), 13 VII Feishu (BL13) and H45 Dingchuan (asthma point) for cough; for asthenia - 36 III Zusanli (ST36), 4 XIV Guanyuan (CV4) and 6 XIV Qihai (CV6); for digestive system disorders - 12 XIV Zhongwan (CV12), 36 III Zusanli (ST36) and 25 III Tianshu (ST25) [43].

Zhang Jiale, Yang Li, Xian Tiancai, Du Jia (2020) the collective of authors, headed by Miao Qing, also offers principles of treatment of patients using methods of traditional Chinese medicine.

Other authors (Seselkina T.N., Zhernov V.A. (2020) present the data on the effect of different methods of reflexotherapy on the parameters of blood flow in the cerebral vessels, the state of the blood coagulation system was studied (decrease of platelet aggregation and blood viscosity was revealed). The positive effects of reflexotherapy in the treatment of arterial hypertension were revealed; a scientific substantiation of the hirudo-reflexotherapy method was given. At the third stage of medical rehabilitation, to prevent thrombosis, in the absence of contraindications, it is possible to supplement the rehabilitation of patients who had a new coronavirus infection COVID-19 with hirudo-reflexotherapy. This method has prospects for use in the follow-up of patients with acute and chronic lung diseases.

According to some studies (Bian Yaqian; Ma Jing; Ren Yue;2020), reflexotherapy can be used in respiratory rehabilitation during the first two months after the acute period of coronavirus infection - during the therapeutic window. It is reasonable to use acupuncture in combination with tszu (heating), point massage and manual therapy methods.

### **Conclusion.**

Neurotropism of SARS-CoV-2 coronavirus leads to neurological disorders of varying severity, which can persist for a long time in the post-COVID-19 period.

High attendance for anxiety disorders, sleep disorders, pain syndrome, persisting dyspnea and asthenia, their significant severity long after the end of the



acute period of the disease, and reduced ability to work require special rehabilitation measures.

The application of physical factors and modified complexes of physical exercises contributes to the alignment of excitation and inhibition processes in the CNS, as well as the development of psychotonic, analgesic and trophostimulating effects.

The program that included the use of reflexotherapy and a complex of physical exercises with elements of traditional oriental gymnastics (qigong, yoga with meditation) proved to be the most effective. This is evident from a greater increase in PC (physical capability) indices, better dynamics of pain reduction, dyspnea, increase in muscle strength indicators, quality of life and psycho-emotional status. Patients without additional training and ART showed the smallest increase in the indicated indices.

### ЛИТЕРАТУРА.

1. Alexandrova E.A., Parshina E.V., Borodacheva I.V., Yulin V.S., Suslov A.G., Belyakov K.M., Fomin S.V. Dynamics of vegetative, insomniac and neuropsychological manifestations during therapy of postvoid syndrome. Medical Advice. 2022; 16(2):76-84. <https://doi.org/10.21518/2079-701X-2022-16-2-76-84>
2. Amirov N.B., Davletshina E.I., Vasilyeva A.G., Fatykhov R.G. Post-COVID syndrome: multisystem "deficits". Bulletin of modern clinical medicine. - 2021. - Vol. 14, issue 6, P.94-104. DOI:10.20969/VSKM.2021.14(6).94-104.
3. Akhmedzhanova LT, Ostroumova TM, Solokha OA. Management of patients with pain syndromes against COVID-19. Neurology, neuropsychiatry, and psychosomatics. 2021;13(5):96-101. DOI: 10.14412/2074-2711-2021-5-96-101
4. Bogolepova NA, Osinovskaya NA, Kovalenko EA, Makhnovich EV. Possible approaches to therapy of asthenic and cognitive impairment in post-COVID syndrome. Neurology, neuropsychiatry, and psychosomatics. 2021;13(4):88-93. DOI: 10.14412/2074-2711-2021-4-88-93
5. Bubnova MG, Shlyakhto EV, Aronov DM, Belevsky AS, Gerasimenko MS, Glezer MG, Gordeev MN, Drapkina OM, Ivanova GE, Iosseliani D.G., Karamnova N.S., Kosmacheva E.D., Kuleshov A.V., Kukshina A.A., Lyadov K.V., Lyamina N.P., Makarova M.R., Mescheryakova N.N, Nikityuk D.B., Pasechnik I.N., Persyanova-Dubrova A.L., Pogonchenkova I.V., Svet A.V., Starodubova A.V., Tutelian V.A. New coronavirus infection COVID-19: features of complex cardiac and respiratory rehabilitation. Consensus of experts of Russian Society for Cardiosomatic Rehabilitation and Secondary Prevention (RosOKR), Russian Society of Cardiology (RSC), Russian Respiratory Society (RRS), Russian Union of





Rehabilitationists (RUR), Russian Union of Nutritionists, Dietitians and Food Industry Specialists (RosNDSPI). Russian Journal of Cardiology. 2021;26(5):4487. doi:10.15829/1560-4071-2021-4487

6. Vorobyov P.A., Vorobyov A.P., Krasnova L.S. Post-COVID syndrome: the image of the disease, concept of pathogenesis and classification. Problems of standardization in health care. 2021; 5-6: 3-10. DOI: 10.26347/1607-2502202105-06003-010.

7. Dudchenko L.Sh., Belyaeva S.N., Kozhemyachenko E.N., Maslikova G.G. Medical rehabilitation of patients with the post-COVID syndrome. Bulletin of Physiotherapy and Balneology. №1, 2021, c.70.

8. Ivanova G.E., Balandina I.N., Bakhtina I.S., Belkin A.A., Belyaev A.F., Bodrova R.A., Builova T.V., Grechko A.V., Didur M.D., Kalinina S.A., Kiryanova V.V., Laisheva O.A., Maltseva M.N., Melnikova Ye, Mishina I.E., Petrova M.V., Pryanikov I.V., Postnikova L.B., Suvorov A.Y., Solovyova L.N., Tsykunov M.B., Shmonin A.A. Medical rehabilitation in new coronavirus infection (COVID-19). Physical and rehabilitation medicine and medical rehabilitation. 2020;2(2):140-189. DOI: <https://doi.org/10.36425/rehab34231>

9. Ivanova G.E., Shmonin A.A., Maltseva M.N., Mishina I.E., Melnikova E.V., Bodrova R.A., Tsykunov M.B., Bakhtina I.S., Kalinina S.A., Balandina I.N., Solovieva L.N., Ivanova N.E, Suvorov A.Y., Didur M.D. Rehabilitation care during the epidemic of new coronavirus infection COVID-19 at the first, second and third stages of medical rehabilitation. Physical and rehabilitation medicine, medical rehabilitation. 2020;2(2):98-117. DOI: <https://doi.org/10.36425/rehab34148>

10. Silantieva E.S. Application of high and low-intensity magnetotherapy in the rehabilitation of patients with COVID-19: a randomized controlled pilot study. Physical and Rehabilitation Medicine, Medical Rehabilitation. 2020;2(4):322-328. DOI: <https://doi.org/10.36425/rehab50236>

11. Tokareva S.V. Evaluation of the effectiveness of transcranial electrostimulation in the rehabilitation of patients who underwent Covid-19. Bulletin of new medical technologies. Electronic edition. 2022. №3. Publication 3-6. URL: <http://www.medtsu.tula.ru/VNMT/Bulletin/E2022-3/3-6.pdf> (accessed 02.06.2022). DOI: 10.24412/2075-4094-2022-3-3-6.

12. Shkadova M.G., Kilessa V.V., Zhukova N.V., Ulchenko I.G., Grigorenko E.I. Stages of medical respiratory rehabilitation in COVID-19. Crimean Therapeutic Journal, 2021, No. 1, pp. 45-54.

13. Shmonin AA, Maltseva MN, Melnikova EV, Mishina IE, Ivanova GE Medical rehabilitation for coronavirus infection: new challenges for physical and rehabilitation medicine in Russia. Bulletin of Restorative Medicine. 2020; 97 (3): 14-21. <https://doi.org/10.38025/2078-1962-2020-97-3-14-21>



14. Garg P, Arora U, Kumar A, Wig N. The «post-COVID» syndrome: how deep is the damage? *J Med Virol.* 2021;93(2):673–674. doi: 10.1002/jmv.26465
15. Huang C, Huang L, Wang Y, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet.* 2021; 397 (10270): 220-232. DOI: 10.1016/S0140-6736(20)32656-8
16. Iqbal A, Iqbal K, Arshad AS, et al. The COVID-19 sequelae: a cross-sectional evaluation of post-recovery symptoms and the need for rehabilitation of COVID-19 survivors. *Cureus.* 2021;13(2):13080. doi: 10.7759/cureus.13080
17. More no-Pérez O, Merino E, Leon-Ramirez JM, et al. Post-acute COVID-19 syndrome. Incidence and risk factors: a mediterranean cohort study. *J Infect.* 2021;82(3):378–383. doi: 10.1016/j.jinf.2021.01.004
18. Wije ratne T, Crewther S. COVID-19 and long-term neurological problems: Challenges ahead with Post-COVID-19 Neurological Syndrome. *Aust J Gen Pract.* 2021;(50). doi:10.31128/AJGP-COVID-43
19. Seye d AS, Afsahi AM, Mohsseni PM, et al. Late complications of COVID-19; a systematic review of current evidence. *Arch Acad Emerg Med.* 2021;9(1):14. doi: 10.22037/aaem.v9i1.1058
20. ICD-10 – International Statistical Classification of Diseases and Related Health Problems 10 revision. <https://mkb-10.com/index.php?pid=23014>
21. Carfi A, Bernabei R, et al. Persistent Symptoms in Patients After Acute COVID-19. *JAMA.* 2020; 324 (6): 603–605. DOI: 10.1001/jama.2020.12603
22. Hu B, Guo H, et al. Characteristics of SARS-CoV-2 and COVID-19. *Nat Rev Microbiol.* 2021; 19 (3): 141-154. DOI: 10.1038/s41579-020-00459-7
23. Vehar S, Boushra M, et al. Post-acute sequelae of SARS-CoV-2 infection: Caring for the ‘long-haulers’. *Cleveland Clinic Journal of Medicine.* 2021; 88 (5): 267-272. DOI: <https://doi.org/10.3949/ccjm.88a.21010>
24. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med.* 2020;8(5):475–481. doi: 10.1016/S2213-2600(20)30079-5.