STUDY OF THE EFFECTIVENESS OF REHABILITATION INTERVENTION FOR THE CORRECTION OF SYMPTOMS OF ASTENO-VEGETATIVE SYNDROME IN ELDERLY PERSONS WITH THE CONSEQUENCES OF CORONAVIRUS INFECTION

ДОСЛІДЖЕННЯ ЕФЕКТИВНОСТІ РЕАБІЛІТАЦІЙНОГО ВТРУЧАННЯ ДЛЯ КОРЕКЦІЇ ОЗНАК АСТЕНО-ВЕГЕТАТИВНОГО СИНДРОМУ У ОСІБ ПОХИЛОГО ВІКУ З НАСЛІДКАМИ ПЕРЕНЕСЕНОЇ КОРОНАВІРУСНОЇ ІНФЕКЦІЇ

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Abstracts

Resume. Purpose is to determine the effectiveness of the developed physical therapy program on the dynamics of astheno-vegetative syndrome in the elderly with the consequences of post-COVID-19 syndrome and sarcopenia.

Material. 108 elderly people were examined. The control group consisted of 33 people who did not suffer from the coronavirus disease. The main group consisted of 75 people who fell ill with coronavirus pneumonia, diagnosed with post-COVID-19 syndrome and sarcopenia. The main group 1 consisted of 34 people who underwent rehabilitation according to the general principles of the Protocol for providing rehabilitation care to patients with COVID-19. The main group 2 consisted of 41 people who underwent rehabilitation according to the developed rehabilitation program that lasted 3 months. It included therapeutic exercises, functional training, Otago exercise program, massage, ergotherapeutic strategies, nutritional recommendations, therapeutic education. The effectiveness of the program was evaluated by Wayne's questionnaire, isometric load test, Kerdo index, results of 24-hour heart rate variability monitoring and spectrogram analysis, Fatigue Assessment Scale, Fatigue Severity Scale.

The results. Signs of astheno-vegetative syndrome were found in elderly with post-convulsive syndrome and sarcopenia: subjective signs of autonomic dysfunction (according to Wayne's questionnaire), predominance of the activity of the sympathetic nervous system over the parasympathetic (according to the results of a test with isometric load, calculation of the Kerdo index, analysis of the spectrogram heart rate variability monitoring), asthenia and severe fatigue (according to the Fatigue Assessment Scale, Fatigue Severity Scale). The developed program of physical therapy showed a statistically significantly better effect ($p<0.05$) on the studied indicators in comparison with the initial parameters and the corresponding data of persons undergoing post-COVID syndrome rehabilitation according to the standard protocol.

Conclusions. Elderly patients with post-COVID-19 syndrome and sarcopenia need the development of physical therapy programs taking into account and correcting the manifestations of astheno-vegetative syndrome.

Key words: rehabilitation, post-COVID-19 syndrome, old age, geriatric syndromes, astheno-vegetative syndrome.

Мета – визначити ефективність впливу розробленої програми фізичної терапії на динаміку астено-вегетативного синдрому в осіб похилого віку з постковідним синдромом та саркопенією.

Матеріал. Обстежено 108 осіб похилого віку. Контрольну групу становили 33 особи, які не хворіли на коронавірусну хворобу. Основну групу становили 75 осіб з діагностованим постковідним синдромом та саркопенією. Основну групу 1 становили 34 особи, які проходили реабілітацію згідно із загальними принципами Протоколу реабілітації пацієнтів з COVID-19. Основну групу 2 становила

41 особа, яка проходила реабілітацію за розробленою програмою реабілітації тривалістю 3 місяці з урахуванням не тільки принципів Уніфікованого протоколу, але й геріатричних особливостей стану пацієнтів. Вона включала терапевтичні вправи, функціональне тренування, Otago exercise programme, курс масажу, ерготерапевтичні методи, рекомендації щодо харчування, терапевтичне навчання пацієнтів та їхніх родин. Ефективність програми оцінювали за опитувальником Вейна, пробою з ізометричним навантаженням, індексом Кердо, результатами 24-годинного моніторування варіабельності серцевого ритму та аналізом спектрограми, Fatigue Assessment Scale, Fatigue Severity Scale.

Результати. У пацієнтів похилого віку з постковідним синдромом та саркопенією виявлено ознаки астено-вегетативного синдрому: суб'єктивні ознаки вегетативної дисфункції (за опитувальником Вейна), переважання активності симпатичного відділу нервової системи над парасимпатичним (за результатами проби з ізометричним навантаженням, обчисленням індексу Кердо, аналізом спектрограми моніторування варіабельності серцевого ритму), стан астенії та вираженої втоми (за Fatigue Assessment Scale, Fatigue Severity Scale). Розроблена програма фізичної терапії показала статистично значуще кращий вплив ($p<0,05$) на досліджувані показники порівняно із вихідними параметрами та відповідними даними осіб, які проходили реабілітацію постковідного синдрому згідно зі стандартним протоколом.

Висновки. Пацієнти похилого віку із постковідним синдромом та саркопенією потребують розробки програм фізичної терапії з урахуванням та корекцією проявів астено-вегетативного синдрому.

Ключові слова: реабілітація, постковідний синдром, похилий вік, геріатричні синдроми, астено-вегетативний синдром.

Introduction. Post-COVID-19 syndrome is a consequence of a viral infection caused by the SARS-CoV-2 coronavirus, in which up to 20% of people suffer from long-term symptoms – up to 12 weeks, and in 2–3% of cases – longer [3]. Post-COVID-19 syndrome develops in 10–35% of patients, and in those who were hospitalized, its frequency reaches 85% [13]. With an equal probability of contact with the coronavirus, people of older age groups are characterized by a more severe course of the disease, compared to young people [3; 4].

The impact of the SARS-CoV-2 virus on the central nervous system is accompanied by impaired sense of smell and taste, hearing, sleep, depressive and anxiety disorders. Such neurological conditions as headache, dizziness, myalgia, encephalopathy, encephalitis, stroke, epileptic seizures, rhabdomyolysis, anosmia have been described [4; 14].

The coronavirus infects peripheral nerves and enters the central nervous system retrogradely by active axonal transport. The reaction of the peripheral nervous system is manifested by movement disorders, neuropathy, myopathy. Damage to the autonomic nervous system is characterized by dysautonomia, which leads to lability of the pulse, blood pressure, breathing, digestive disorders, sweating, thermoregulation disorders, etc.; the functional imbalance of its parts (sympathetic hyperstimulation and parasympathetic inhibition) may be the cause of long-term post-COVID-19 disorders [2; 5; 14].

In COVID-19, neurological, immunological, and respiratory dysfunctions can ultimately cause asthenic syndrome or chronic fatigue, which include both cognitive and neuromuscular aspects, forming the post-COVID-19 syndrome [3; 13]. In the pathogenesis of chronic fatigue syndrome and asthenia, in particular, as a result of a viral infection, an imbalance between gamma-aminergic and dopaminergic transmission has been demonstrated [7].

The occurrence of asthenia and its persistent nature after a coronavirus infection are caused primarily by the neurotropic effect of the virus on neurons, secondary hypoxia, endothelial dysfunction with endotheliopathy and the development of microthrombosis, autoimmune reactions with microglial activation [7; 14].

Research rationale. A particularly vulnerable group during the COVID-19 pandemic was the elderly, who suffered from a number of negative factors leading to social isolation, stress, anxiety, and depression [3; 13]. In addition, due to low immune reactivity and the presence of geriatric syndromes, the elderly are prone to a more severe course of the disease, infectious complications, the occurrence and progression of geriatric syndromes of sarcopenia, malnutrition, etc. [1; 8].

Clinical manifestations of asthenia can be expressed by a decrease in physical activity, increased fatigue during the day, the need for rest, and the lack of a feeling of full recovery after rest. A decrease in mental activity may be noted, such as impaired concentration and attention, absent-mindedness [11; 12]. Emotional symptoms of asthenia occur as a decrease in the tolerance of emotional loads, emotional lability, increased vulnerability, rapid transitions from irritability to exhaustion. In contrast to ordinary fatigue, post-COVID-19 asthenia is a pathological condition and is not eliminated by rest, which leads to a significant decrease in work capacity, disruption of usual life activities and can create the ground for more severe mental and somatic disorders [7; 14].

Thus, to date, the problem of optimal comprehensive action on neurotransmitter systems in order to normalize the functioning of the autonomic nervous system and further regression of the asthenic syndrome by medicinal and non-medicinal methods in patients who have suffered from COVID-19 is relevant. It is advisable to carry out such measures during the rehabilitation intervention and to combine them with the use of means of motor influence to reduce the risks associated with the loss of muscle mass – balance disorders, the risk of falling, deterioration in the performance of activities of daily life, etc. [3; 10].

The purpose of the study is to determine the effectiveness of the developed physical therapy program on the dynamics of the asthenovegetative syndrome in the elderly with the consequences of post-COVID-19 syndrome and sarcopenia.

Materials and methods. 108 elderly people were examined (average age 68.3±1.2 years). The control group (CG) consisted of 33 people (18 men, 15 women), who did not suffer from the coronavirus disease. The main group consisted of 75 people who contracted coronavirus pneumonia and were diagnosed with post-COVID-19 syndrome. The representatives of this group were divided into two subgroups by a blind randomized method. Main group 1 (MG1) consisted of 16 men and 18 women who underwent rehabilitation in polyclinic conditions according to the general principles of the Protocol for providing rehabilitation care to patients with coronavirus disease (COVID-19) and convalescents [7]. Main group 2 (MG2) consisted of 18 men and 23 women who underwent rehabilitation according to the principles of this protocol, but taking into account the peculiarities of the pathogenesis and clinical course of geriatric syndromes, which was reflected in the developed physical therapy program.

Inclusion criteria: advanced age according to WHO criteria (60–75 years); sarcopenia according to the results of the Short Physical Performance Battery [8]; laboratory-confirmed COVID-19, the severity of which required hospital treatment; the presence of signs of post-COVID-19 syndrome according to the criteria of the National Institute for Health and Care Excellence (NICE) [3]; the degree of functional impairment according to the Post-COVID-19 Functional Status scale – 2–3 [9]; consent to participate in the study. Exclusion criteria: presence of severe somatic concomitant pathology (oncological diseases, severe heart failure, etc.); moderate or severe dementia of any origin; acute cardiovascular or cerebrovascular accidents during the implementation of the rehabilitation program or in the anamnesis.

The developed program of physical therapy lasted 3 months in the format of classes in the rehabilitation center (first month), hybrid online and in the rehabilitation institution (second month), online format (third month). It included therapeutic exercises (breathing, for the development of strength, endurance, balance, coordination, flexibility, balance); functional training; independent implementation of the Otago exercise program [15]; full body massage course with an emphasis on the chest; occupational therapy strategies (aimed at reducing the risk of falling, overcoming limitations due to weakness, possible correction of cognitive suppression as a consequence of post-COVID-19 syndrome); nutritional recommendations for reducing the signs of malnutrition, leveling asthenia and sarcopenia

(optimal amount of protein, easily digestible, adequate caloric intake, sufficient hydration, use of vitamin D, appetite stimulation); therapeutic education of patients and their families (the principles of a fall-safe environment, informing about the risks associated with non-compliance with the principles of treatment and rehabilitation of post-COVID-19 syndrome and the progression of geriatric syndromes). The tasks of the program were: correction of the respiratory consequences of COVID-19 (improvement of the function of external breathing), as well as non-respiratory ones – normalization of the functions of the autonomic nervous system due to the balanced activity of its part; reduction of asthenia and muscle weakness, in particular, as a result of malnutrition, and other possible manifestations of geriatric syndromes that were initiated by COVID-19; improving strength and endurance to levels sufficient to safely perform activities of daily living independently; development of the concept of understanding the state of health in the patient and his family and its maintenance for an indefinite long time, which is due to the geriatric specificity of physiological processes.

Astheno-vegetative syndrome was defined as a set of signs of vegetative dysfunctions and manifestations of physical and mental asthenia.

The presence of autonomic dysfunction was determined according to Wayne's autonomic changes detection questionnaire (less than 15 points – absent autonomic dysfunction, 15–25 points – moderate autonomic dysfunction, more than 25 points – pronounced autonomic dysfunction). The state of the autonomic nervous system was assessed by the balance of its sympathetic and parasympathetic links based on the results of the test with isometric load (by the dynamics of the diastolic blood pressure (DBP) level), the determination of the Kerdo index, the dynamics of indicators of 24-hour heart rate variability monitoring and the analysis of the spectrogram by power indicators in low frequency range (LF), ms^2 (0.04–0.05 Hz), power in the high frequency range (HF), ms^2 (0.15–0.4 Hz), LF/HF ratio, Baevsky voltage index.

The impact of fatigue on daily activity was assessed using the Fatigue Assessment Scale (less than 22 points – normal level of fatigue, 22–34 points – moderate level of fatigue, more than 35 points – severe fatigue) [12].

The importance of fatigue was characterized by the Fatigue Severity Scale (less than 36 points – no fatigue, more than 36 points – fatigue) [11].

The research was carried out taking into account the principles of the Declaration of Helsinki of the World Medical Association "Ethical principles of medical research with the participation of a person as an object of research". Informed consent was obtained from all elderly persons included in the study. The research protocol was discussed, approved and approved at the meeting of the Bioethics Commission of Vasyl Stefanyk Precarpathian National University.

In order to achieve the goals and objectives of the research, all the obtained data were summarized and processed by statistical research methods. Data processing (calculation of the arithmetic mean ($\bar{x}$) and mean square deviation (S); assessment of the reliability of the obtained indicators according to the Student's criterion) was carried out using the statistical software package Statistica 10. The critical level of significance when testing statistical hypotheses in this study was taken to be equal to 0.05.

Research results. The condition after suffering from COVID-19, which was associated with psycho-emotional and physical stress, discomfort and pain, hypoxia, caused exhaustion and changes in the functioning of the autonomic nervous system in individuals MG1 and MG2. Vegetative dysfunction in the elderly, in addition, may be associated with concomitant diseases, in particular – of the cardiovascular system, which were not an exclusion criterion according to the study design.

During the initial examination, signs of autonomic dysfunction according to Wayne's questionnaire were found in all elderly persons (Fig. 1). According to absolute numerical values, its value in CG corresponded to moderate autonomic dysfunction, in both main groups it was pronounced and was statistically significantly more pronounced than in CG ($p<0.05$).

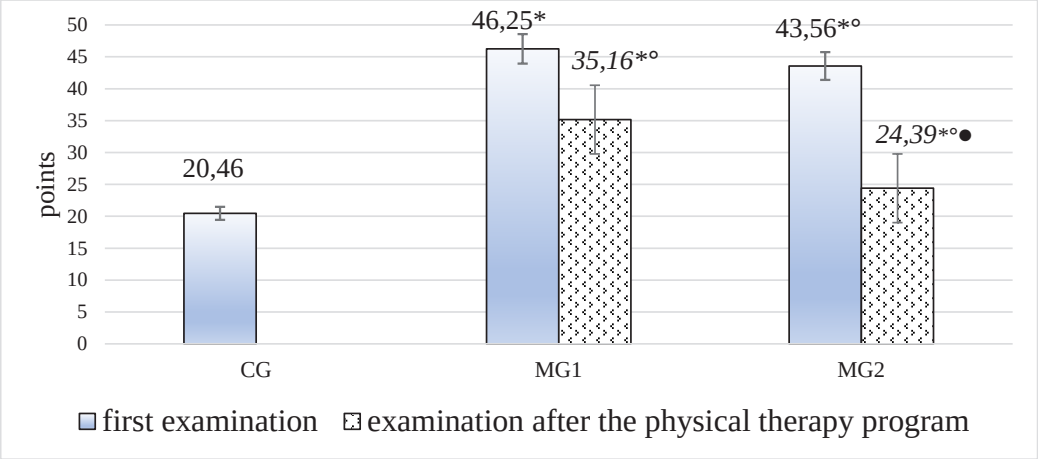

Fig. 1. Dynamics of indicators of autonomic dysfunction according to Wayne's questionnaire (points) in elderly people with sarcopenia and post-COVID-19 syndrome under the influence of physical therapy program, %

(* – $p<0.05$ – statistically significant difference between the corresponding parameters of CG and MG; ° – $p<0.05$ – statistically significant difference between the corresponding parameters at the initial and repeated examinations; ● – $p<0.05$ – statistically significant difference between the corresponding parameters MG1 and MG2)

Subjective feelings of autonomic dysfunction were confirmed by appropriate functional tests and instrumental research methods.

In all elderly, the increase in blood pressure during the test with isometric load with a hand dynamometer, which in this case was correlated with the activity of the sympathetic nervous system, exceeded the limits of adaptive reactions and can be considered pathological, with a more pronounced negative trend in patients who suffered from the coronavirus disease ($p<0.05$ relative to the CG indicator) (Table 1). An unbalanced sympathotonic reaction of the autonomic nervous system is also indicated by the results of calculating the Kerdo index, which was high in all groups of elderly, also with higher results in patients with post-COVID-19 syndrome ($p<0.05$) (table 1).

The revealed regularities of the dynamics of the results of functional tests for diagnosing the state of the autonomic nervous system were confirmed in the analysis of the data of 24-hour heart rate variability monitoring. For elderly people with post-COVID-19 syndrome, a predominance of the low-frequency component of rhythmograms – LF, reflecting the activity of the sympathetic link of the autonomic nervous system (Table 2) was established. The opposite pattern was noted for the dynamics of the high-frequency component of rhythmograms, which reflects the activity of the parasympathetic department – HF. The imbalance of parts of the autonomic nervous system was evidenced by the Baevsky index, the absolute digital indicators of which in patients with the consequences of the coronavirus disease also indicated an increased tension in the body's regulatory systems (Table 2).

According to the Fatigue Assessment Scale, which assesses the presence and degree of fatigue, all patients with post-COVID-19 syndrome had severe fatigue, apparently associated with mental and physical discomfort, sleep disturbances, etc. (compared to their peers, who also have fatigue was diagnosed, but at a moderate level). A similar trend was determined by the severity of fatigue according to the Fatigue Severity Scale (Table 3).

The results of the primary examination characterized the homogeneity of the main groups according to the studied parameters of the astheno-vegetative syndrome.

During re-examination, the physical and mental status of MG1 individuals improved as

Table 1

Dynamics of functional tests for the assessment of the autonomic nervous system in the elderly with sarcopenia and post-COVID-19 syndrome under the influence of the physical therapy program ($\bar{x} \pm S$)

Evaluation parameters	CG (n=33)	MG1 (n=34)		MG2 (n=41)	
		first examination	examination after the physical therapy program	first examination	examination after the physical therapy program
Index Kerdo	1.23±0.06	2.25±0.09*	1.75±0.11*°	2.33±0.12*	1.27±0.09°
Test with isometric load, increase in DBP for 3 minutes	14.30±0.12	9.57±0.45*	12.65±0.11*°	10.02±0.15*	15.05±0.16°

Notes: * – $p<0.05$ – statistically significant difference between the corresponding parameters of CG and MG;

° – $p<0.05$ – statistically significant difference between the corresponding parameters at the initial and repeated examinations;

● – $p<0.05$ – statistically significant difference between the corresponding parameters MG1 and MG2.

Table 2

Dynamics of 24-hour monitoring of heart rate variability in elderly with sarcopenia and post-COVID-19 syndrome under the influence of a physical therapy program ($\bar{x} \pm S$)

Spectrogram parameters	CG (n=33)	MG1 (n=34)		MG2 (n=41)	
		first examination	examination after the physical therapy program	first examination	examination after the physical therapy program
LF, ms^2	1342.32±	2308.15±	1911.53±	2351.30±	1547.09±
HF, ms^2	973.11±	733.18±	812.52±	727.38±	940.38±
LF/HF	1.38±	3.15±	2.35±	3.23±	1.65±
Baevsky index	53.67±	155.22±	121.46±	146.92±	72.15±

Notes: * – $p<0.05$ – statistically significant difference between the corresponding parameters of CG and MG;

° – $p<0.05$ – statistically significant difference between the corresponding parameters at the initial and repeated examinations;

● – $p<0.05$ – statistically significant difference between the corresponding parameters MG1 and MG2.

Table 3

Dynamics of signs of fatigue in the elderly with sarcopenia and post-COVID-19 syndrome under the influence of a physical therapy program ($\bar{x} \pm S$)

Rating scale	CG (n=33)	MG1 (n=34)		MG2 (n=41)	
		first examination	examination after the physical therapy program	first examination	examination after the physical therapy program
Fatigue Assessment Scale	23.89±1.32	43.23±2.15*	35.40±2.17*°	41.28±2.11*	27.05±1.16*°●
Fatigue Severity Scale	32.44±1.18	54.23±2.03*	44.82±1.19*°	52.12±2.06*	39.23±1.42*°●

Notes: * – $p<0.05$ – statistically significant difference between the corresponding parameters of CG and MG;

° – $p<0.05$ – statistically significant difference between the corresponding parameters at the initial and repeated examinations;

● – $p<0.05$ – statistically significant difference between the corresponding parameters MG1 and MG2.

a result of physiological recovery after the viral disease and the impact of recovery measures on the course of the post-COVID-19 syndrome. The analysis of the obtained results showed that the physical therapy program, created taking into account the needs of patients from the standpoint of existing geriatric pathology, the needs and lifestyle of the elderly, has advantages in

comparison with the standard recovery program for patients with post-COVID-19 syndrome, which, in particular, we associate a much better rehabilitation alliance.

In particular, under the influence of restorative intervention, there was an improvement in the vegetative status, which was manifested by a decrease in the severity of vegetative disorders according to the Wayne's questionnaire (in MG1 – by 24%, remaining at the level of pronounced vegetative dysfunction), in MG2 – by 44% (reaching the upper limit of moderate vegetative dysfunction). The results of MG2 patients were statistically significantly better than MG1 ($p<0.05$), although they did not reach the level of CG ($p>0.05$) (Fig. 1).

The results of the recalculation of the Kerdo index showed positive dynamics in individuals of both main groups towards the balance of the sympathetic and parasympathetic departments of the autonomic nervous system (Table 1). The Kerdo index decreased in MG1 by 22%, MG2 – by 45.5%, i.e. it became probably smaller compared to its value at the beginning of the study ($p<0.05$).

After applying the rehabilitation program, changes in the parameters of the test with isometric load were noted: the dynamics of the DBP level in the third minute of the study in MG1 improved by 32.2%, MG2 by 50.2% ($p<0.05$) (Table 1).

According to the data of re-registration of heart rate variability, a decrease in the activity of the sympathetic division of the autonomic nervous system was established, which was evidenced by a decrease in the power value in the LF frequency range. Positive dynamics of the frequency response of the activity of the parasympathetic department – HF waves – were noted, the values of which in MG2 approached those in the control group. Accordingly, the LF/HF ratio improved in MG1 by 25.4%, MG2 by 48.9% ($p<0.05$). Similar trends were noted for the dynamics of the ratio of low- and high-frequency elements of rhythmograms and the Baevsky index: in MG1 – by 21.7%, MG2 – by 50.9% (Table 2).

Under the influence of the physical therapy program, there was a decrease in the feeling of fatigue of the main groups to a moderate level according to the digital parameters of the Fatigue Assessment Scale (table 3). Also, the importance of fatigue according to the Fatigue Severity Scale has decreased compared to the initial examination. Representatives of MG2 showed the best result according to individual tests ($p<0.05$ compared to other groups); although the relevant CG parameters were not reached ($p>0.05$).

Discussion. During the period of convalescence and elimination of the coronavirus, many patients have the prerequisites for the chronicity of a number of symptoms of the disease. This is associated with degenerative and inflammatory changes in the musculoskeletal system, immune disorders, organic damage to the peripheral and central nervous system, which determine the possibility of developing peripheral and central sensitization, psycho-emotional problems, as well as visceral pathology, which creates a comorbid background [3; 4; 13].

The conducted study shows that a high frequency of astheno-vegetative syndrome is diagnosed among patients who apply for the consequences of a transferred coronavirus infection. This requires appropriate training of rehabilitation specialists for timely diagnosis, if necessary, using special questionnaires and scales, and prescribing adequate physical therapy. The data of domestic and foreign studies also indicate the frequent development of asthenic and cognitive disorders in patients after contracting COVID-19 [2; 5; 14].

Asthenia has a significant negative impact on work capacity, physical and mental endurance, stress resistance, quality of life, and the consequences of rehabilitation [7]. Our study revealed the persistence of astheno-vegetative disorders, which in some cases do not fully regress within 3–4 months after the coronavirus infection, even against the background of treatment and rehabilitation intervention. This indicates the need for timely diagnosis and adequate rehabilitation of astheno-vegetative syndrome in a vulnerable contingent of patients with post-COVID-19 syndrome – the elderly – with the use of personalized physical therapy

programs, created taking into account the peculiarities of their lifestyle changes.

Knowledge of clinical forms, their combinations, diagnostic algorithms and methods of objective assessment, characteristic of post-COVID-19 syndrome functional and structural changes in the brain, autonomic and peripheral nervous system, is important not only for making a diagnosis, choosing pharmacotherapy and methods of neurorehabilitation, but also for predicting the results, justifying preventive measures to prevent the negative impact of the transferred disease on the physical, social, and mental well-being of the patient, prevention of negative results in the form of loss of working capacity, disability and delayed long-term consequences and autoimmune pathology) [1; 3; 13].

Our study confirmed the polymorphism of the signs of post-COVID-19 syndrome and demonstrated the relevance of differentiating approaches to the rehabilitation of post-COVID-19 syndrome in elderly with geriatric syndromes. The described syndromes, from the point of view of the expediency of active rehabilitation intervention, are united by the fact that the use of non-drug rehabilitation, primarily motor activity, has an effect on the pathogenesis of post-COVID-19 syndrome and the etiopathogenesis of asthenia, autonomic dysfunction. Accordingly, their use accelerates the recovery of patients, and taking into account the principles of geriatric rehabilitation in the scheme of recovery of patients with the consequences of the transferred coronavirus disease is justified [6; 10], as demonstrated by the results of our study.

Conclusions.

1. Elderly patients with post-COVID-19 syndrome and sarcopenia showed signs of astheno-vegetative syndrome, namely: subjective signs of autonomic dysfunction (according to Wayne's questionnaire), predominance of the activity of the sympathetic nervous system over the parasympathetic (according to the results of a test with isometric load, Kerdo index calculation, spectrogram analysis of 24-hour heart rate variability monitoring), asthenia and severe fatigue (according to the Fatigue Assessment Scale, Fatigue Severity Scale).

2. The developed rehabilitation program with the use of therapeutic exercises, functional training, massage, occupational therapy, nutritional correction, therapeutic training of patients taking into account geriatric features showed a statistically significantly better effect ($p<0.05$) on the studied indicators in comparison with the initial parameters and relevant data persons who underwent post-COVID-19 syndrome rehabilitation according to the standard protocol.

3. Elderly patients with post-COVID-19 syndrome and sarcopenia need to develop physical therapy programs taking into account and correcting the manifestations of astheno-vegetative syndrome.

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