

The Impact of Selected Lifestyle Factors on the Functional Fitness of Stroke Patients during the Covid-19 Pandemic

Wpływ wybranych czynników związanych ze stylem życia na sprawność funkcjonalną pacjentów po udarze mózgu w czasie pandemii Covid-19

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Abstract

Introduction. Stroke is the cause of death in approximately 30,000 Poles yearly. Assessment of the functional capacity of patients after stroke and the factors influencing its course is utterly important because it allows to determine the level of nursing care need.

Aim. The aim of the study was to assess the functional capacity of patients after stroke and the impact of lifestyle-related stroke risk factors on the effectiveness of rehabilitation depending on the type of stroke suffered during the Covid-19 pandemic.

Material and Methods. The study group included 89 patients (38 women and 51 men) after hemorrhagic or ischemic stroke hospitalized under early neurological rehabilitation. Functional fitness was assessed using the 20-point Barthel scale and the NHPT (Nine Hole Peg Test) test to assess hand function.

Results. The study reported a statistically significant impact of rehabilitation on the functional capacity of patients after stroke. The age influence on the type of stroke was also noticed — people with ischemic stroke were older compared to people with hemorrhagic stroke. Stroke patients with diabetes, hypertension or obesity achieved statistically worse results compared to patients without these comorbidities.

Conclusions. Age is an important risk factor for ischemic stroke. Furthermore people after stroke who suffer from diabetes, hypertension and obesity require more intensive rehabilitation. (JNNN 2023;12(4):157–163)

Key Words: functional capacity, nursing care, risk factors, stroke

Streszczenie

Wstęp. Udar mózgu jest przyczyną śmierci u ok. 30 tys. Polaków rocznie. Ocena sprawności funkcjonalnej pacjentów po udarze mózgu oraz czynników wpływających na jej przebieg jest niezwykle ważna, gdyż pozwala określić stopień zapotrzebowania na opiekę pielęgniarską.

Cel. Celem pracy była ocena sprawności funkcjonalnej pacjentów po udarze mózgu oraz wpływu czynników ryzyka udaru mózgu związanych ze stylem życia na skuteczność rehabilitacji w zależności od typu doznanego udaru w czasie pandemii Covid-19.

Materiał i metody. Badaną grupę stanowiło 89 pacjentów (38 kobiet i 51 mężczyzn) po udarze mózgu krwotocznym lub niedokrwiennym hospitalizowanych w ramach wczesnej rehabilitacji neurologicznej. Sprawność funkcjonalną oceniano przy pomocy 20-punktowej skali Barthel oraz testu NHPT (Nine Hole Peg Test) do oceny funkcji ręki.

Wyniki. W przeprowadzonym badaniu odnotowano istotny statystycznie wpływ rehabilitacji na sprawność funkcjonalną pacjentów po udarze mózgu. Zauważono również wpływ wieku na rodzaj udaru, osoby z udarem niedokrwiennym

mózgu były starsze w porównaniu z osobami z udarem krwotocznym. Pacjenci po udarze mózgu obciążeni cukrzycą, nadciśnieniem tętniczym lub otyłością uzyskiwali statystycznie gorsze wyniki w porównaniu z pacjentami bez wymienionych chorób współistniejących.

Wnioski. Wiek jest istotnym czynnikiem ryzyka udaru niedokrwienego mózgu. Ponadto osoby po udarze mózgu z cukrzycą, nadciśnieniem tętniczym i otyłością wymagają prowadzenia intensywniejszej rehabilitacji. (PNN 2023; 12(4):157–163)

Słowa kluczowe: sprawność funkcjonalna, opieka pielęgniarska, czynniki ryzyka, udar mózgu

Introduction

The incidence of strokes and their related degree of disability continue to be a concern for many people. Despite medical progress, strokes are the third cause of death in the world after heart disease and cancer. It is estimated that in Poland a stroke occurs every 8 minutes, and the incidence rate is 177 per 100,000 men and 125 per 100,000 women and remains at the average European level. Unfortunately, the high mortality rate amounts to 106 per 100,000 men and 79 per 100,000 women and is one of the highest in Europe. In this group, in approximately 25–50% of patients, a stroke resulted in permanent disability requiring care and dependence on other persons. Limb paresis, hemiplegia, memory disorders, aphasia and amblyopia are just some of the problems faced by patients and their caregivers. It is estimated that in 2018, the costs of all hospitalization services related to strokes amounted to PLN 630.4 million and accounted for 1.5% of all NFZ [National Health Fund] expenditure on hospital treatment [1]. In such context, primary prevention becomes particularly important, as it involves reducing the intensity of stroke risk factors. There are many lifestyle risk factors for stroke that may impact a person at risk of having one. Identification of modifiable risk factors and appropriate patient education will effectively reduce the number of repeated strokes. A nurse, as a member of the therapeutic team, has an important role to play here. They perform important role in identifying stroke risk factors and in planning and implementing secondary prevention.

Special precautions were introduced during the rapid increase in infections domestically and worldwide. Wearing masks, keeping social distance was ordered, a strict lockdown was even temporarily introduced; schools, restaurants, churches were closed, remote work and learning were launched. The fear of getting infected with SARS-CoV-2 meant that even the appointments with a general practitioner were remote instead of appearing in person. As a result of these actions, there was a significant reduction in the incidence of acute strokes in emergency departments by approximately 30%. The fear of coronavirus infection might have resulted in the reluctance of patients with minor stroke symptoms to come to the hospital, thus reducing the number of registered patients [2]. The effects of the COVID-19

pandemic and related restrictions may have had a significant impact on lifestyle. Improper diet, low physical activity and sleep deficiency are important elements of one of the risk factors for stroke — diabetes [3].

The aim of the study was to assess the functional capacity of patients after stroke and the impact of lifestyle-related stroke risk factors on the effectiveness of rehabilitation depending on the type of stroke suffered during the Covid-19 pandemic.

Material and Methods

Subjects of Study

The study group involved 89 patients of both sexes (38 women and 51 men) admitted to the neurological rehabilitation ward at the Dziekanka Provincial Hospital for the Neurologically and Mentally Ill in Gniezno during the Covid-19 pandemic (from January 2020 to March 2021). The research was conducted based on the analysis of medical records (disease records). The qualifying criterion for the study group was a recorded stroke and the presence of lifestyle-related risk factors for stroke. Relevant factors include obesity, hypertension, diabetes and smoking. During rehabilitation, lasting on average 41 ± 12 days, patients participated in the rehabilitation process. Passive and active bedside exercises were applied; verticalization by learning to sit in a wheelchair, standing aid, and walk with the help of orthopedic devices. Self-service, manual, and neurophysiological methods exercises were also used (Proprioceptive Neuromuscular Facilitation and Neuro-Developmental Treatment — Bobath).

Study Methodology

The functional efficiency of the study group was assessed with a modified 20-point Barthel index. It includes the following elements: taking care of personal hygiene, taking meals, knowing how to use the toilet, moving around, dressing, and controlling sphincters. A patient who received less than 6 points was considered to have a severe disability [4].

The Nine Hole Peg Test was used to assess the hand function of the examined patients. This test is used to assess the finger dexterity. A wooden board was used with holes with a diameter of 1.3 cm, spaced 3.2 cm apart, and 9 wooden pegs, 3.2 cm long and 0.64 cm thick. The pegs were inserted into a container on the side of the subject's dominant hand. The test involved placing all the pegs in the holes in time. The test was performed twice for each limb. For women, the norm was 17.9 ± 2.8 s for the right hand and 19.6 ± 3.4 s for the left hand. For men, the norm was an average of 19.0 ± 3.2 s for the right hand and 20.6 ± 3.9 s for the left hand [5]. The Barthel index and the NHPT Test were standardly used to assess the rehabilitation progress of patients in the ward.

The study was approved by the Ethics Committee at the Provincial Hospital for the Mentally and Mentally Ill Dziekanka in Gniezno on 21.04.2021.

Statistical Methods

Calculations were performed using Statistica 13 by TIBCO and PQStat by PQStat Software. The level of significance was $\alpha=0.05$. The result was considered statistically significant when $p < \alpha$. The regularity of variables distribution was tested with the Shapiro–Wilk test. The Mann–Whitney U test was applied to compare variables between the 2 groups. The Student's t-test for related samples or the Wilcoxon test were applied to examine whether changes in the analyzed variables are statistically significant over time. The Chi-square test of independence or Fisher's exact test were applied to examine the relation between categorical variables. Logistic regression models were calculated to check which factors have the greatest impact on the type of stroke.

Results

The study included 89 patients (38 women and 51 men) after hemorrhagic or ischemic stroke hospitalized under early neurological rehabilitation. The average age of the subjects was 49 ± 6 years. Data on the study group of patients are presented in Table 1.

The study showed a significant impact of rehabilitation on the functional capacity of people with stroke. A statistically significant improvement was achieved in the entire study group. At the time of discharge, patients received higher scores on the Barthel index $Me=17$ (min 10, max 20) compared to the results on the day of admission. $Me=13$ pct. (min 3, max 18, Wilcoxon test $p \leq 0.0010$).

Table 1. Characteristics of the study group

Variable	N	%
Gender		
Women	38	42.69
Men	57	57.30
Education		
Primary	38	42.69
Secondary	42	47.19
Higher	9	10.11
Occupational status		
Works professionally	81	91.01
Unemployed	6	6.74
Stroke type		
Hemorrhagic stroke	24	26.96
Ischemic stroke	65	73.03
Body weight		
Normal weight	22	24.72
Obesity	67	75.28
Diabetes	16	17.97
Smoking	52	58.42
Hypertension	20	22.47

N — number of observations; % — percent

In tests assessing hand function (NHPT), a statistically significant improvement was also obtained in the entire study group. The average total time for the right upper limb at discharge was lower than at admission (22 ± 13 s vs. 26 ± 17 s, $p \leq 0.0010$, Wilcoxon test). A similar result was obtained for the left upper limb; the average total time at discharge was lower than at admission (22 ± 11 s vs. 26 ± 14 s, $p \leq 0.0010$ Wilcoxon test).

The study noted the effect of age on the type of stroke. People with ischemic stroke were statistically significantly older (50 ± 5 years) compared to people with hemorrhagic stroke (46 ± 8 years) Mann–Whitney U test, $p=0.008$.

In the study group, the influence of some stroke risk factors was assessed, such as age, gender, hypertension, obesity, and nicotine addiction on the type of stroke. In the group of people with hemorrhagic stroke ($N=24$), 25% of patients previously suffered from hypertension, while in the group of people with ischemic stroke ($N=65$), 21.5% of patients were treated for hypertension. There was no statistically significant impact of the presence of hypertension on the type of stroke, but it occurred with a similar frequency in both women and men. However, it was noticed that patients after stroke who previously suffered from hypertension were, on average, statically older than patients without hypertension (52 ± 3.3 vs. 48 ± 6.4 $p=0.015$, Mann–Whitney U test) (Figure 1).

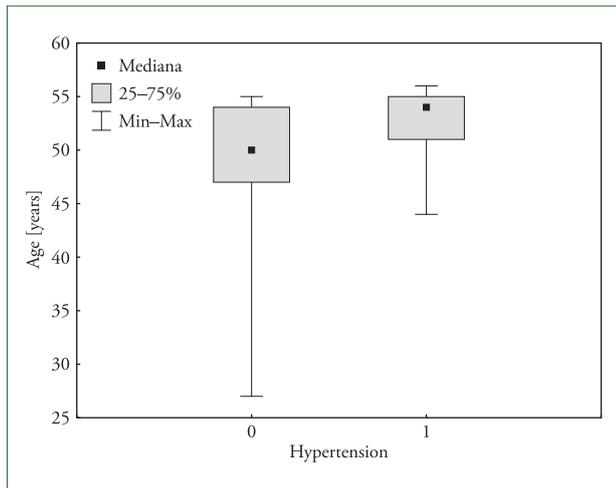


Figure 1. The effect of the presence of arterial hypertension on the age of the examined patients

The analysis showed a statistically significant relation between the Barthel index test results and the occurrence of hypertension. People after stroke with hypertension obtained statistically worse results on the Barthel index both at the beginning and at the end of hospitalization (Me=8 points vs. Me=14 points, $p=0.0029$) compared to people after stroke without hypertension (Me=15 vs. Me=18 points, $p=0.0003$ Mann–Whitney U test) (Figure 2).

It was also examined how the Barthel score changed over time in the group of people with and without hypertension. No statistically significant differences were noted.

In the results of the NHPT test assessing the functional efficiency of the upper limbs, a statistically significant relations between the results and the presence of hypertension were noted. People after stroke with arterial hypertension achieved on average statistically worse results in the NHPT test for the right upper limb after rehabilitation compared to people after stroke without arterial hypertension (28 ± 13 s vs. 20 ± 13 s, $p=0.0474$ Mann–Whitney U test).

Obesity was another risk factor for stroke assessed in the study. In the study group of people after hemorrhagic stroke ($N=24$) 62% were with obesity, while in the group of patients after ischemic stroke ($N=52$) 80% of patients were obese. There was no statistically significant relation between obesity and the type of stroke, although the result was at the limit of statistical significance ($p=0.089$, test χ^2).

The gender of the obese people examined had no effect on the type of stroke suffered; both obese men and women suffered from hemorrhagic and ischemic stroke with the same frequency.

There was a statistically significant relationship between obesity and the age of the examined patients. Obese people were, on average, statistically significantly older than non-obese people (51 ± 4 vs. 45 ± 8 , $p=0.009$ Mann–Whitney U test).

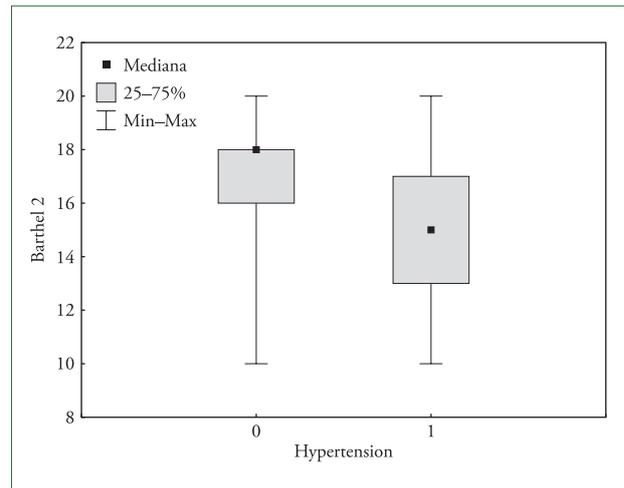


Figure 2. The effect of the presence of hypertension on the Barthel scores

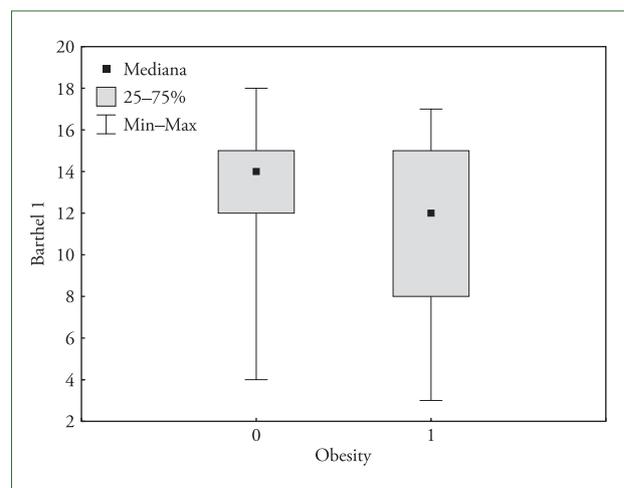


Figure 3. The effect of the presence of obesity on the Barthel scores

On the Barthel index assessing functional fitness, obese people after stroke obtained statistically significantly worse results compared to people without obesity before rehabilitation (Me=12 vs. Me=14, $p=0.0489$, Mann–Whitney U test) (Figure 3).

In the NHPT test for assessing hand function, there were no statistically significant differences between the results of obese people and patients with normal body weight, both before and after rehabilitation.

The analysis assessed the impact of diabetes on hand function. People with diabetes had, on average, statistically worse results in the NHPT test for the right hand at the time of discharge than people without diabetes (30 ± 13 vs. 29 ± 12 , $p=0.002$, Mann–Whitney U test).

There was no statistically significant impact of nicotine addiction on the type of stroke suffered on the Barthel index or the NHPT test.

The logistic regression method was applied to examine which factors such as diabetes, obesity, hypertension, nicotine addiction, gender and age had the greatest impact on the type of stroke suffered. The results of the

analysis showed that only age has a statistically significant significance for distinguishing the type of stroke, i.e. the older a person, the greater the chance of suffering an ischemic stroke (OR=1.12; 95% CI 1.04–1.22; $p=0.004$).

Discussion

Strokes are still a serious cause (third, after heart disease and cancer) of death in adults or their permanent disability resulting in dependence on others. Approximately 70,000 inhabitants suffer a stroke in Poland every year, of which 30% die, and most of those who survive require assistance in basic life activities [1]. The patient's chances of survival depend largely on quick contact with the appropriate center and medical intervention. Unfortunately, the time of the Covid-19 pandemic did not favor early recognition of the first symptoms of a stroke and admission to the hospital. The fear of contracting the coronavirus has repeatedly stopped patients from seeking help. The World Stroke Organization (WSO) has noted a decrease in the number of acute stroke cases during the Covid-19 pandemic, with SARS-CoV-2 infection itself being described as one of the causes of stroke [6]. Restrictions in access to family doctor's and specialist clinics, social isolation, and increasing stress during the COVID-19 pandemic brought additional burdens and may have increased the risk of stroke. The consequence of a stroke is motor disability, limiting the ability to perform everyday activities. In Poland, as many as 25–50% of patients suffer from impaired mobility due to paresis [7]. Therefore, early assessment of the patient's functional status and the search for factors supporting the rehabilitation process after a stroke seem to be extremely important.

The study addresses the issue of the impact of rehabilitation on the functional efficiency of a group of people after a hemorrhagic or ischemic stroke. There was a statistically significant, beneficial effect of early neurological rehabilitation on the patients' performance both in the Barthel index and in the NHPT test assessing hand functions. The average total score obtained on the Barthel index after the completion of the improvement process was 16.56 points. Similar results were obtained by Spanish researchers Cabanas-Valdés et al., who assessed a similar group of 80 stroke patients. Their study concluded that the conventional rehabilitation process improves physical fitness, including trunk stabilization, balance when standing and walking, and leads to improved activities of daily living. The examined patients obtained an average of 13.17 points on the Barthel index [8].

The resulting paresis of the upper limb after a stroke, especially of the dominant hand, sometimes makes it impossible to perform basic life activities. For this reason,

early rehabilitation of the stroke-affected limb is extremely important. The analysis showed a beneficial effect of early neurological rehabilitation on the manual dexterity of the upper limbs. The impairment of dexterity of the paretic limb was assessed using the NHPT test, a simple and cheap tool for assessing manual dexterity [9]. In the NHPT test, a statistically significant improvement in the efficiency of both the left and right upper limb was noted. Similar conclusions are described by many researchers, emphasizing the importance of early neurological rehabilitation. It involves the use of brain neuroplasticity and the ability to learn again the lost activities in the first weeks after a stroke [10,11].

Awareness of stroke risk factors and actions taken to reduce the risk of recurrence should be of great importance. Unfortunately, knowledge about the symptoms of stroke and related complications is low in Poland. In this context, the nurse's role in building health awareness among patients is utterly important. One of the tasks should be to shape the model of an active and conscious patient. Education should include the causes and pathomechanism of the disease and following a proper lifestyle [12]. Weight loss, a healthy diet, regular physical activity, quitting smoking and limiting alcohol consumption can reduce the risk of stroke by up to 50% [13]. The causes of stroke were the aim of one of the largest epidemiological studies, INTERSTROKE, conducted in 22 different countries, aimed at raising awareness of risk factors for this disease. The study assessed the impact of 10 modifiable factors on the risk of hemorrhagic or ischemic stroke. These included hypertension, smoking, obesity, diabetes, physical inactivity, heart disease, alcohol abuse and stress [14].

The study also assessed the impact of some risk factors on the functional efficiency of the study group. There was a statistically significant effect of age on the type of stroke suffered, and older people were at greater risk of suffering an ischemic stroke. Similar conclusions were reached by Czech researchers Sedova et al., who conducted a large study in Brno in four hospitals on 808 patients after various types of stroke [15].

Arterial hypertension is one of the most common and most dangerous risk factors for stroke, both ischemic and hemorrhagic. It is commonly known that as blood pressure increases, the chance of having a stroke increases too [16,17]. The analyzes conducted on a group of 402 patients at the Neurology Ward in Białystok by Kapica-Topczewska et al. show that over 2/3 of patients had more than one risk factor for stroke, the most common factor was hypertension [18]. In the study, people after stroke with hypertension achieved statistically significantly worse results in tests assessing their functional fitness compared to people without hypertension. Similar results are described by Kleinrok et al., indicating an increased risk of lower independence in people after

stroke with comorbidities such as hypertension and diabetes [19].

Diabetes is a well-known risk factor for stroke. The presented study also noted a significant impact of diabetes on the performance of patients after stroke. Patients with diabetes obtained statistically worse results on both the Barthel index and the NHPT test compared to people without diabetes. Research by Iwase et al. conducted on a large group of the Japanese population with type II diabetes shows that ischemic stroke was significantly related with age, male gender and reduced regular physical activity. In turn, lacunar infarction was significantly related with obesity and reduced regular physical activity [20].

Obesity is another lifestyle-related modifiable risk factor for stroke. The analysis noted the impact of obesity on the functional capacity of patients after stroke. Obese people after stroke had more extensive disability compared to people without obesity. The latest report by Forlivesi et al. shows that most studies indicate better results in assessing the functional capacity of patients after stroke with obesity. The author points out that this may be related to the so-called obesity paradox in stroke and it is a controversial issue that requires more research [21].

Tobacco smoking is also a strong, modifiable risk factor for both ischemic and hemorrhagic stroke. The available research shows that smokers are more than twice as likely to suffer a stroke [22]. The analysis did not show statistically significant impact of nicotine addiction on the type of stroke suffered.

Although it is widely known that a healthy lifestyle reduces the risk of stroke and stroke mortality, few people follow the binding recommendations, especially in disadvantaged socio-economic communities [23]. The study by Redfern et al. on behavioral risk factors in the South London population after stroke and the analysis of lifestyle changes showed that one year after stroke 22% of patients were still smoking, 36% were obese and 4% were abusing alcohol [24].

Neurological rehabilitation is important for improving the functional capacity of patients after stroke. By increasing functional efficiency, a person suffering from a stroke can improve their physical activity and become a self-sufficient individual in their environment. Poorer functional capacity is inextricably linked to a greater demand for nursing care and care of family members. Age and comorbidities such as diabetes, hypertension or obesity may have a negative impact on improving functional efficiency. Some of the risk factors for stroke are modifiable. Efforts should be made to increase society's knowledge about these factors and promote a healthy lifestyle. Nurses have a huge role to play here by educating both the patient and their family. A qualified nursing team with knowledge of the factors influencing the improvement of patients' capacity will appropriately

assess the patient's condition and plan the nursing process. Unfortunately, the time of the Covid-19 pandemic limited access to specialized stroke treatment centers for quick medical intervention. It seems important that some systemic solutions be ensured to prevent similar situations the future, in the event of further epidemics.

Despite the limitations of the presented study, which may be too low number of patients in the group of people after hemorrhagic stroke and the assessment of only a few risk factors for stroke, the presented results seem interesting and require further research.

Conclusions

Older people are at greater risk of suffering an ischemic stroke. People after stroke who suffer from diabetes, hypertension and obesity require more intensive rehabilitation.

Implications for Nursing Practice

An important element in the work of a nurse caring for a patient after a stroke is the assessment of his functional status, it means the need for care of a patient. Assessment of stroke risk factors and their minimization will help reduce the incidence of this condition. Nurses' educational activities aimed at promoting a healthy diet and physical activity, resigning from smoking, and lowering blood pressure can significantly reduce the incidence of stroke.

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