ORIGINAL ARTICLE

doi: 10.5455/medarh.2014.68.124-127

Published online: 22/04/2014
Published print: 04/2014

Med Arh. 2014 Apr; 68(2): 124-127
Received: January 11th 2014 | Accepted: April 15th 2014

Assessment of the Effects of Rehabilitation After Cerebrovascular Accident in Patients with Diabetes Mellitus and Hypertension as Risk Factors

Edina Tanovic[1], Senad Selimovic[2], Haris Tanovic[3]

Clinic of Physiatry and Rehabilitation, Clinical center of Sarajevo University, Sarajevo, Bosnia and Herzegovina [1]
JZU BRC Aquaterm, Olovo, Bosnia and Herzegovina [2]
Clinic of Abdominal Surgery, Clinical canter of Sarajevo University, Sarajevo, Bosnia and Herzegovina[3]

Corresponding author: Edina Tanovic, ass.prof. Clinic of Physiatry and Rehabilitation, KCUS, Sarajevo, Bosnia and Herzegovina. Phone: +387 33 278 465; Email: tanovicedina@hotmail.com:

ABSTRACT

Aim: The aim of this study is to evaluate the results of rehabilitation, to determine the prevalence of major risk factors in cerebrovascular accident and their consequences, as well as to propose measures and procedures that will affect the better rehabilitation. **Methods:** The survey analyzed: age, sex, duration of rehabilitation, activities in daily life through the Barthel index at admission and at discharge, presence of risk factors HTA and DM. The study included a total of 116 patients, the majority of patients are older than 61 years. We had 49% of male patients and 51% of female patients and they spent 31-40 days at the rehabilitation. **Results:** The most common risk factor is HTA (83%) and diabetes (33%). Most of the patients at admission had a BI from 0 to 4 (32.7%), and at discharge BI in the range 17-20 (36.2%). Statistical analysis shows that there is a statistically significant correlation between the BI at admission, BI at discharge and risk factors of HTA and diabetes mellitus. **Conclusions:** the rehabilitation results in most patients is good results of rehabilitation. The most important risk factors in patients are HTA, DM and directly affect on results of rehabilitation. For the better results we should have energetic fight against risk factors for HTA and DM through primary and secondary prevention and patient education about early detection and treatment of these risk factors.
Key words: rehabilitation, cerebrovascular accident (CVA), Barthel index (BI).

1. INTRODUCTION

In 1970 World Health Organization defined cerebrovascular accident as a "neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours (1)." According to the World Health Organization (WHO) and the statement "The global burden of disease", CVA is the second leading cause of mortality in the world in 1990 year and the third leading cause of death in developed countries, causing about 4.4 million deaths (2). The latest assessment showed that in 2002, the number of deaths from CVA has reached 5.51 million worldwide, and two-thirds of these deaths occur in developing countries (3). According to the Institute of Public Health FBiH, considering diagnosis in period from 2008 to 2012 the leading cause of death in this population is stroke (17 % for 2012) from the group of cerebrovascular disease (52.9 % for 2012) (4). CVA is the leading cause of disability in the community, and the age category of elderly people is most prone to cerebrovascular accident (5). CVA is classified, by etiology of focal brain damage, as ischaemic and hemorrhagic stroke. Risk factors that influence appearance of the CVA, and ones that could be affected are: hypertension (HTA) and diabetes mellitus (DM). Hypertension or high blood pressure is very common. It is estimated that in the U.S. one in four people have HTA. (6) Persons who have HTA have a three times greater risk of stroke, the incidence of stroke increases with an increase in both systolic and diastolic blood pressure, and treatment of HTA reduces the risk of stroke by 30 % (7). DM or abnormal glucose regulation (hyperinsulinemia and insulin resistance) denotes elevated values of blood glucose. It has long been known that DM is associated with an increased risk of atherosclerosis, cardiovascular disease and ischaemic cerebrovascular accident, increased mortality in patients with CVA (8, 9). The incidence of stroke increases with increasing blood glucose so that it is two times greater in diabetics than in patients with borderline blood glucose values. Optimizing of the body weight and glucose metabolism are obviously very important strategies to reduce the risk of stroke. Recent studies have identified the endocannabinoid system and the cannabinoid receptor CB1 as important in determining the energy balance and body composition. CB1 receptor is an important target for the blockade in an

attempt to reduce body weight and waist circumference (10). Consequences after CVA may be a major cause of disability, and therefore represent a major public health problem. The aim of this study is to evaluate the results of rehabilitation, to determine the prevalence of major risk factors in cerebrovascular strokes and their consequences, as well as to propose measures and procedures that will affect the better rehabilitation.

2. PATIENTS AND METHODS

The study was descriptive-analytical and retrospective–prospective type based on the analysis of data from the history of the diseases. The study included a total of 116 patients diagnosed with CVA rehabilitated at the Department of Physical Medicine and Rehabilitation at KCUS in a period of one year.

During data acquisition, processing and presentation of the tables, the privacy of the patients was not compromised, first and last names were not mentioned, initials of the target group were not mentioned too. The survey analyzed: age, sex, duration of rehabilitation, assessment of activities in daily life through the Barthel index at admission and at discharge, presence of risk factors such as HTA and DM.

3. STATISTICAL ANALYSIS

Results are displayed numerically and graphically with legends and text explanation of some obtained values and variables. Statistical data analysis were performed on the PC programs such as SPSS v16.0, MS Excel 2007. Parametric data were analyzed showing the absolute value, calculation of the percentage value, the arithmetic mean with the obligatory calculation of the standard deviation, while non-parametric data were processed with chi-square test.

4. RESULTS

Results are presented on Figures 1-5.

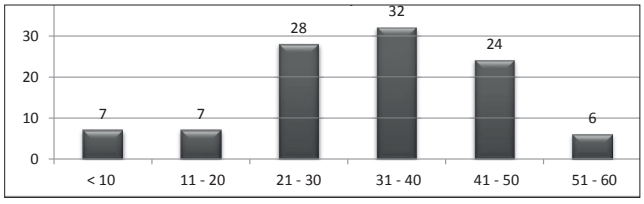

Figure 1. Analysis of the duration of rehabilitation.

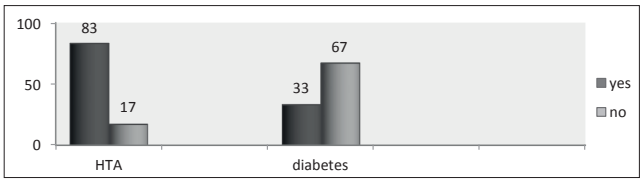

Figure 2. Analysis of risk factors of diabetes mellitus and high blood pressure affecting the occurrence of CVA.

5. DISCUSSION

Cerebrovascular accident or stroke is a neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours. First, the early part of the rehabilitation is applied in a "stroke unit" on neurological clinic. In the further course of treatment it is recommended to continue rehabilitation program in stationary institutions because the best results are achieved immediately after cerebrovascular stroke.

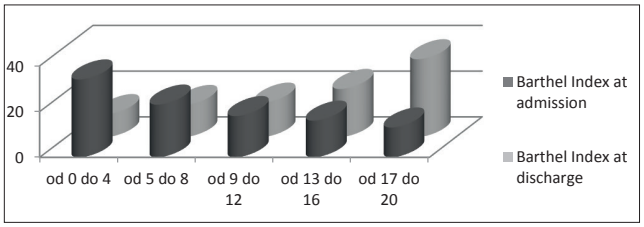

Figure 3. Analysis of activities of daily living by Barthel Index at admission and discharge.

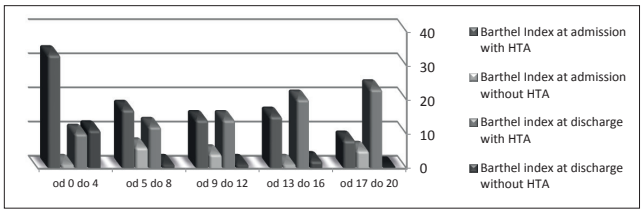

Figure 4. Analysis of Barthel Index at admission and Barthel index at discharge and risk factors of HTA.

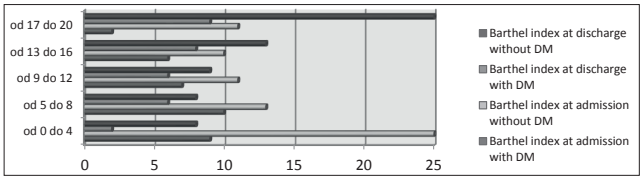

Figure 5. Analysis of activities of daily living by Barthel index at admission and Barthel index at discharge and risk factors of diabetes mellitus.

In our research we included 116 patients with stroke who are admitted, in a period of one year, for rehabilitation at the Clinic of Physical Medicine and Rehabilitation. Patients were analyzed by age and found to have predominantly suffered after 60 years of age (77 %), which is one of the risk factors that we cannot influence. The results are shown on Figure 1, where we can see that 33 % of patients were between 61-70 years of age, and 34 % of 71 to 80 years of life. This finding is consistent with data from the literature (11). Our earlier research also showed similar data (12, 13).

Analysis of patients by gender showed that cerebrovascular accident occurred in 49 % of male patients and 51 % of female patients. Data from the literature suggest just the opposite, much higher incidence within male population (14, 15). Our research conducted earlier showed the same results as we got in this study and it does not match with generally accepted data. (16. 17).

The Figure 1 shows the time that patients spent in the rehabilitation in the stationary institutions. The majority of patients with cerebrovascular infarction 32 (28 %) spent 31-40 days at the rehabilitation and at least over 50 days. Today, we strive to shorten period of rehabilitation in stationary institution to prove rehabilitation as efficient and economical. In our previous studies, the rehabilitation period typically lasted longer than in this study (12, 17). Study conducted ten years ago shows a longer stationary rehabilitation treatment with worse rehabilitation results. However, other researchers have shown that it is possible to even more shorten stationary rehabilitation

period without compromising the results of recovery (18). The analysis of Figure 2 shows that in patients suffering from stroke the most common risk factor are HTA with 83 % incidence, and DM with 33 % incidence. These two risk factors fall into those factors that can be affected, kept under control and therapeutically minimize their harmful effects. Our previous studies showed that HTA was represented with 81 % which means 74 % of patients (13). DM was represented with 30 % which means 29 % of patients (19). From these results we can see that there is no significant difference in all the researches that are conducted at different times in our institution. Smaller representation of DM as risk factor can be interpreted as a higher and better control of risk factors. However, other studies show lesser prevalence of HTA 58 % and 28 % DM than it is present in this study, which is probably consequence of early detection and treatment of these risk factors (14). Studies from other areas show the incidence of HTA is 65 %, and 22% is DM patients with stroke, which is considerably less than in our study (20).

Evaluating the results of rehabilitation after stroke, we demonstrated the value of Barthel Index, which assesses the activities of daily life for all patients who have been involved in a rehabilitation program. These results were shown in Figure 3. The smallest Barthel Index at admission and at discharge is 0, and the 20 is largest. Most of the patients at admission had a Barthel index in the range from 0 to 4 (32.7 %), and least in the range 17-20 (12.5 %). At discharge most patients had a Barthel index in the range of 17-20 (36.2 %) and lowest in the range of 0-4 (10.6 %). These data show significantly better results of rehabilitation than in our previous studies where 6 % of patients had a Barthel index from 0 to 4, and 19 % of patients had a Barthel Index 17 to 20 (21). Studies, conducted by other authors that also evaluated Barthel Index, showed that the best recovery in functional status of the patients was with those which had intensively monitored rehabilitation program in the first six months after the occurrence of CVA. This study showed a smaller mortality rate in patients who had hypertension and DM as risk factors (22).

Figure 4 show the results of the assessment of rehabilitation according to Barthel Index in patients who had hypertension (high blood pressure) as risk factor. Statistical analysis shows that there is a statistically significant correlation between the Barthel index at admission, Barthel index at discharge and risk factors of HTA. When analyzing the patients at admission using group with and without high blood pressure, we see that there is a statistically significant difference in the results of rehabilitation by Barthel index at admission, $p < 0.001$. Analysis of patients with and without the high blood pressure at discharge showed a statistically significant difference by Barthel index at discharge as $p < 0.001$. Studies by other authors and our previous studies have shown that the results of rehabilitation by Barthel Index were lower in patients who had high blood pressure as a risk factor (13, 23). Rehabilitation of patients with HTA is more complex with frequent complications, especially of this disease (23).

We also analyzed the influence of DM as risk factor in assessing the results of rehabilitation and display the results in the table and Figure 5. Based on the data presented on Figures 1-5 it has been proved that there is a statistically significant correlation between the Barthel index at admission and Barthel index at discharge and risk factors of DM because value is $p < 0.001$ for patients who had not had this risk factor. This data shows that patients who had DM as a risk factor had a statistically significantly lesser results of rehabilitation process than those patients who did not have this risk factor. Our previous studies have shown the same results (13, 19). Results of other studies have shown that people with DM and CVA were getting this disease in younger age than those who did not have the disease. Studies have shown that the rehabilitation process after stroke is very difficult and is also linking with age (24).

Statistical analysis demonstrated that there was a statistically significant correlation between the Barthel index at discharge and risk factors such as HTA and DM. Patients who had DM and HTA as risk factors had lower values of Barthel index at the beginning of rehabilitation compared to those who did not have these risk factors. They also had worse results at the end of rehabilitation process which speaks of the need for secondary prevention as noted by other authors who have dealt with similar studies (25, 26).

6. CONCLUSION

Research conducted has shown that the rehabilitation results in most patients (36.2%) were in the range of 17-20 per Barthel Index, which is considered good results of rehabilitation. The most important risk factors in patients with CVA are very common and in the values of: HTA 83%, DM 33%, and directly affect the poor results of rehabilitation. The measures and procedures that will affect the better results of rehabilitation are: energetic fight against risk factors for hypertension and diabetes mellitus which we can influence through primary prevention and patient education about early detection and treatment of these risk factors. After the occurrence of stroke, it is necessary to spend more energetic fight to control risk factors through secondary prevention of possible new cerebrovascular stroke.

List of Abbreviation:
CVA- cerebrovascular accident
BI- Barthel index
HTA- hypertension
DM- diabetes mellitus

CONFLICT OF INTEREST: NONE DECLARED

REFERENCES

1. World Health Organisation. Cerebrovascular Disorders: a clinical and research classification (Offset Publications). [Online]. Available from: http://whqlibdoc.who.int/offset/WHO_OFFSET_43.pdf [Accessed 21th Decembar 2013]
2. Sarti C, Rastenyte D, Cepaitis Z, Tuomilehto J. International trends in mortality from stroke, 1968 to 1994. Stroke. 2000; 31: 1588-1601.
3. Murray CJL, Lopez AD. Mortality by cause for eight regions of the world: Global Burden of Disease Study. Lancet. 1997 May 3; 349(9061): 1269-1276.
4. Zavod za javno zdravstvo FBiH. Zdravstveno stanje stanovništva i zdravstvena zaštita u Federaciji Bosne i Herce-

govine 2012. godina. [Online]. Available from: http://www.zzjzfbih.ba/wp-content/uploads/2009/02/Zdravstveno-stanje-stanovnis%CC%8Ctva-i-zdravstvena-zas%CC%8Cita-u-FBiH-2012.pdf [Accessed 20th Decembar 2013]
5. Stein J, Harvey R, Macko R, Winstein C, Zorowitz R. Stroke Recovery and Rehabilitation. New York: Demos medical publishing; 2009.
6. Kannel WB. Blood pressure as a cardiovascular risk factor. JAMA. 1996; 275(20): 1571-1576.
7. SHEP Cooperative Research Group: Prevention of stroke by antihypertensive drug treatment in older persons with isolated systolic hypertension. JAMA. 1991 Jun 26; 265(24): 3255-3264.
8. Dorndorf W, Marx P. Stroke Prevention. In: Louis R. Caplan (eds.) Caplan's Stroke: A Clinical Approach. 4th ed. Philadelphia: Sounders Elsevier; 2009: 581-592.
9. Gorelick PB, Alter M. The Prevention of Stroke. Boca Raton, Fla: Parthenon Publishing Group, 2002. . In: Louis R. Caplan (eds.) Caplan's Stroke: A Clinical Approach. 4th ed. Philadelphia: Sounders Elsevier; 2009: 581-592.
10. Depres J-P, Golay A, Sjostrom L. Effects of imonabant on metabolic risk factors in overweight patients with dyslipidemia. Rimonabant in Obesity-Lipids Study Group. N Engl J Med. 353.
11. Al-Eithan MD, Amin M, Robert AA. The efects of hemiplegia/hemiparesis, diabete mellitus and hypertension on hospital length of stay after stroke. neurosciences (Riyadh). 2011: 16(3): 253-256.
12. Tanović E. Uticaj etioloških faktora na rehabilitaciju nakon cerebrovaskularnog inzulta. Treći kongres fizijatara i Prva ISPO konferencija BiH sa međunarodnim učešćem, 27-30. oktobra 2010, Tuzla , Zbornik radova 54.
13. Tanović E, Tanović H. Functuional elektric stimulation on walking rehabilitation on patients with hemiplegia after stroke. Neurol Croat. 2007; 56(1): 188-194.
14. Ones K, Yalcukaya EY, Toklu BC, Caglar N. Effects of age, gender and cognitive functional and motor status on functional otucomes of stroke rehabilitation. NeuroRehabilitation. 2009; 25(4): 241-249.
15. Ripley DL, Seel RT, Macciocchi SN, Schara SL, Raziano K, Ericson JJ. The impact of diabetes mellitus on stroke acute rehabilitation outcome. 2007; 86(9): 754-761.
16. Tanović E. Gait Training and Functional Elaktric Stimulation with Hemiplegic Patients. Med Arh. 2007; 61(2): 82-85.
17. Tanović E. Effects of Functional Elektric Stimulation in Rehabilitation with Hemiparesis Patients. Bosnian Journal of Basic Medical Sciences. 2009; 9(1): 49-53.
18. Putman K, Horn S, Smonth R, Dejong G, Deutcher D, Tian W, Hsich CH. Racial disparities in stroke functional outcomes upon discharge from patients rehabilitation facilities. Disabil rehabil. 2010; 32(19): 1604-1611.
19. Tanović E, Brbović E, Hodžić N, Meholjić A, Tanović H. Uticaj diabetes mellitusa kao rizikofaktora na hemiplegije. Kongres ljekara za fizilanu medicinu i rehabilitaciju s međunarodnim ućešćem. 1. Knjiga sažetaka, Sarajevo, Sarajevo. Udruženje ljekara za fizikalnu medicinu i rehabilitaciju BiH, 2000: 55.
20. Gokkaya N, Aras M, Caralmas D, Kaya A. Stroke rehabilitation outcomes: the Turkish experiences. Int J Rehabili Res. 2006; 29(2): 105-111.
21. Tanović E, Tanović H. Valorization of the rehabilitation after cerebrovacular insult by ET-test.Europ J Physical and Rehabilitation medicine. 2010; 46(2): 165.
22. De Wit L, Putman K, Devos H, Brikmann N, Dajarger E, De Weerdt W. et all. Five-year mortality and related prognostic factors after inpatient stroke rehabilitation: a European multi-centre study. J Rehabil Med. 2012; 44(7): 547-552.
23. Gravely S, Reid RD, Oh P, Ross H, Stewart DE, Grace SL. A prospective examinitation of disease management program use by complex cardiac outpatients. Can J Cardiol. 2012; 28(4): 490-496.
24. Piernek-Yoder B, Ketchum N. Rehabilitation outcomes of stroke patients with or without diabetes. Arch Physical Rehabil. 2013; 94(8): 1508-1512.
25. Zorowitz RD. Stroke rehabilitation quality indicators: raising the bar in the inpatient rehabilitation facility. Top Stroke Rehabil. 2010; 17(4): 294-304.
26. Graham JE, Ripsin CM; Deutch A, Kuo YF, Markello S, Granger CV; Ottenbacher KJ. Relationship between diabetes codes that affect Medicare reimbursement (tier comorbidities) and outcomes in stroke. Arh Phys Med Rehabil. 2009; 90(7): 1110-1116.