FREQUENCY AND CHARACTERISTICS OF STROKE IN PATIENTS HOSPITALIZED AT THE CLINIC FOR NEUROLOGY OF THE CLINICAL CENTRE OF THE UNIVERSITY OF SARAJEVO

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ABSTRACT

Introduction: Stroke is by far the most frequent and significant neurological disease in adulthood. In transition countries such as Bosnia and Herzegovina, stroke is at the top of the mortality scale, together with heart diseases. Objective: Review the frequency of stroke in patients hospitalized at Clinic for Neurology, Clinical Centre of the University of Sarajevo (CCUS), to present their clinical-epidemiological characteristics, and point out to the importance of diagnostic methods and the identification of stroke risk factors. Subjects and methods: In this retrospective, descriptive and clinical-epidemiological study, data were collected in the period from 2013 to 2015. The study included 4258 hospitalized patients, with 1694 suffered from stroke. The study is based on the analysis of data from patients'' medical histories.

Results: The prevalent type of stroke was ischemic (84.5%, in average) while the most represented was thrombotic stroke (34.6% in average). Motor deficit is the leading symptom (61%), while arterial hypertension is the most represented (80.0%) factor of risk. The patients, at the most (72.4%), are the retired persons, most commonly (17.1%) sales persons as professional occupation recorded. Ischemic CVI is more common in patients from urban areas, while in patients from rural areas it is the hemorrhagic CVI. Complete independence with lighter consequences (62.0%) is the most common post incidence outcome, while death (50.0%) is the statistically significant outcome in patients with ischemic CVI with hemorrhagic transformation. Conclusion: The study reveals an evident escalation in the number of stroke patients pertinent to the aging, while the younger population is not being spared either. Despite the fact that the prevention is the best approach to stroke issue, there are high frequency of risk factors present.

Key words: stroke, frequency, risk factors

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INTRODUCTION

Cerebrovascular diseases (CVD) is a name for a group of diseases that affect blood vessels of the brain or in the neck; most often the arteries, and less often veins and venous sinuses. In most cases, these diseases cause circulatory disorders that manifest in form of stroke syndrome (1). Cerebrovascular disease is the final act of long-term changes in blood vessels that began many years before the first manifestation of the disease. These blood system changes gain the momentum in person's middle age and quietly prepare the ground for the occurrence of the initial symptoms (2). Stroke is by far the most frequent and significant neurological disease in adulthood and accounts for at least 30 to 70% of all patients (3). Annually, out of a million citizens, around 2400 will suffer stroke. For about 75% of them it would be the first stroke, while the rest would be relapses of the previous one (1). In transition countries such as Bosnia and Herzegovina, stroke is at the top of the mortality scale, together with heart diseases (4). All patients with suspected acute stroke should be treated with the same priority level that is applied for patients with acute myocardial infarction or with severe trauma, regardless of severity and deficit, because it would significantly improve the prognosis of the disease outcome. Patients who come to emergency medical care unit represent the mainstream of patients who reach an adequate health facility within a three-hour window. Prompt evaluation and diagnosis are necessary, due to the fact that therapy timeslot to treat acute ischemic stroke with thrombolytic therapy is a narrow one. It is necessary to provide general supportive care and treat acute complications. Detecting the etiology of stroke is a prerequisite for optimal treatment and the secondary prevention (1, 5). The development of diagnostic methods has made it possible to differentiate and have better understanding of the different etiopathogenetic causes of stroke, thus adapting therapy to a particular type of stroke, which includes medicinal, surgical or endovascular therapy (1). Each stroke is specific and depends on many factors, primarily the side of the brain affected, the severity of the damage, as well as the overall condition of the patient. Generally, in case of stroke, the rule of thirds applies; out of the total number of patients, approximately one-third would die immediately after a stroke, a third would be permanently disabled, thus dependent on others, and one third of the patients would recover into complete independence or possibly suffer milder consequences (6). The social and economic consequences of a stroke are an encumbrance for the patient, while for society it reflects in terms of premature death, long-term disability, and cost of care and loss of productivity (7).

A stroke causes physical, mental and emotional sufferings and in the process of recovery, in addition to the patient himself, medical team, family and friends play a special role. Diagnostic and therapeutic procedures require a multidisciplinary approach, where in everyday's work it is very important to detect and act on reducing and/or eliminating of risk factors for the

occurrence of stroke, for the purposes of primary or secondary prevention (8).

The main aim of this study was to review the frequency of stroke in patients hospitalized at Clinic for Neurology, Clinical Centre of the University of Sarajevo (CCUS) in period from 2013 to 2015, to present their clinical-epidemiological characteristics, and point out to the importance of diagnostic methods and the identification of stroke risk factors.

SUBJECTS AND METHODS

In this retrospective, descriptive and clinical-epidemiological study, data were collected from the Clinic for Neurology of the Clinical Centre of the University of Sarajevo (CCUS) in the period from 2013 to 2015. The study involved all of the hospitalized patients, 4258 in total, with 1694 patients diagnosed with stroke.

The study included: 1) all the patients hospitalized under the diagnosis of: ischemic cerebrovascular insult (ICVI); classified by type of thrombosis, embolism, thromboembolism, lacunar infarction and with hemorrhagic transformation, hemorrhagic CVI, by type of intracerebral and subarachnoid hemorrhage, and transient ischemic attacks, as well as their recurrence, 2) patients of both sexes, and 3) all patients regardless of their age (patients in this study were aged 18 to 102 years old).

The data collected for the study consist of the following parameters: prevalence, type and subtypes of stroke, gender and age of the patients, prevalence of the leading symptoms, presence of risk factors for the occurrence of stroke, employment status and the most common type of profession, marital status, division according to residence type, frequency in relation to the season, number of days spent in hospital, the outcome, and the presence of atherosclerotic changes determined by ultrasound diagnostics performed.

The study utilized and analyzed the available data from the patient histories at the Clinic for Neurology of the CCUS, with the approval of the Clinic.

Statistical analysis

In the statistical processing of the results, standard methods of descriptive statistics have been applied. The Hi-square ($\square^2$) test, Fisher's (F) test and Student's (t) test have been applied to test the statistical significance of the differences between the selected variables. The statistical significance of the difference of the results was tested at the level of $p \leq 0.05$ which means that a value of $p < 0.05$ is considered as statistically significant.

RESULTS

In the observed period, the representation by type of insult is approximately at the same level, where ischemic CVI accounts for the largest number of patients (84.5%). Out of that percentage, the most represented is the one by type of thrombosis (34.6%), followed by recurrent by type of thrombosis (29.7%) and recurrent by type of embolism (14.0%). A significant statistical difference was observed in ischemic CVI by type of embolism; 14.0% in 2013 compared to 9.9% in 2014, p=0.02 (Table 1.).

Table 1. Total number of hospitalized patients with stroke at the Clinic for Neurology of the CCUS in the period from 2013-2015.

	2013		2014		Total	
ISCHEMIC CEREBROVASCULAR INSULT						
By type of thrombosis	240	29.7%	255	28.8%	495	29.2%
By type of embolism	71	8.8%	69	7.8%	140	8.3%
By type of thromboembolism	0	0.0%	1	0.1%	1	0.1%
By type of lacunar infarction	27	3.3%	40	4.5%	67	4,0%
With hemorrhagic component	19	2.4%	17	1.9%	36	2.1%
Recurrent by type of thrombosis	193	23.9%	233	26.3%	426	25.1%
Recurrent by type of embolism	113	14.0%	88	9.9%	201	11.9%
Recurrent by type of thromboembolism	0	0.0%	1	0.1%	1	0.1%
Recurrent by type of lacunar infarction	20	2.5%	30	3.4%	50	3.0%
Recurrent with hemorrhagic compoment	2	0.2%	13	1.5%	15	0.9%
Total ischemic CVI	**685**	**84.8%**	**747**	**84.3%**	**1,432**	**84.5%**
HEMORRHAGIC CEREBROVASCULAR INSULT						
Intracerebral hemorrhage	85	10.5%	86	9.7%	171	10.1%
Subarachnoid hemorrhage	4	0.5%	0	0.0%	4	0.2%
Recurrent intracerebral hemorrhage	4	0.5%	6	0.7%	10	0.6%
Total hemorrhagic CVI	**93**	**11.5%**	**92**	**10.4%**	**185**	**10.9%**
TRANSIENT ISHEMIC ATTACK						
Transient ishemic attack	28	3.5%	40	4.5%	68	4.0%
Recurrent transient ishemic attack	2	0.2%	7	0.8%	9	0.5%
Total transient ischemic attack	**30**	**3.7%**	**47**	**5.3%**	**77**	**4.5%**
TOTAL STROKE	**808**	**100.0%**	**886**	**100.0%**	**1,694**	**100.0%**

There is approximately the same total number of male and female patients affected by stroke, with a slightly larger number of female patients, thus statistically women were significantly more likely to get affected by ischemic CVI by type of embolism, 85 out of 863 or 9.8 %, p=0.016 (men 55 out of 831 or 6.6%), as well as by the recurrent ischemic CVI by type of embolism, 136 out of 863 or 15. 8% (men 65 out of 831 or 7.8 %) while men suffered more often from ischemic thrombotic CVI with 30.9% compared to women (257 out of 831) as well as recurrent by type of thrombosis, 28.5 % or 237 out of 831 (Table 2).

Table 2. Gender distribution of study population.

	Male		Female		Total
ISCHEMIC CEREBROVASCULAR INSULT					
By type of thrombosis	257	30.9%	238	27.6%	495
By type of embolism	55	6.6%	85	9.8%	140
By type of thromboembolism	1	0.1%	0	0.0%	1
By type of lacunar infarction	27	3.2%	40	4.6%	67
With hemorrhagic component	21	2.5%	15	1.7%	36
Recurrent by type of thrombosis	237	28.5%	189	21.9%	426
Recurrent by type of embolism	65	7.8%	136	15.8%	201
Recurrent by type of thromboembolism	1	0.1%	0	0.0%	1
Recurrent by type of lacunar infarction	22	2.6%	28	3.2%	50
Recurrent with hemorrhagic compoment	9	1.1%	6	0.7%	15
Total ischemic CVI	**695**	**83.6%**	**737**	**85.4%**	**1,432**
HEMORRHAGIC CEREBROVASCULAR INSULT					
Intracerebral hemorrhage	90	10.8%	81	9.4%	171
Subarachnoid hemorrhage	1	0.1%	3	0.3%	4
Recurrent intracerebral hemorrhage	5	0.6%	5	0.6%	10
Total hemorrhagic CVI	**96**	**11.6%**	**89**	**10.3%**	**185**
TRANSIENT ISHEMIC ATTACK					
Transient ishemic attack	35	4.2%	33	3.8%	68
Recurrent transient ishemic attack	5	0.6%	4	0.5%	9
Total transient ischemic attack	**40**	**3.7%**	**37**	**4.3%**	**77**
TOTAL STROKE	**831**	**100.0%**	**863**	**100.0%**	**1,694**

Ischemic CVI is the most represented one in all the age groups observed; in the youngest group, aged up to 45 years, the rate is 67.3%, in the middle age group (people aged 46-75) with 84.6%, and in the eldest age group, persons older than 75 years, with 85.7%. Analyzing individual types of stroke, cerebral embolism is the most common with the eldest age group (over 75 years) with 11.7% compared to the middle age group 6.4%, which is highly statistically significant (p<0.001), as well as repeated cerebral embolism with 16.7% compared to the data for the middle age group, which is 9.4% (p<0.001). Thrombotic CVI is highly, statistically significantly, present with patients of the middle age group with 33.2% than in the eldest group with 22.9% (p<0.001). In the youngest patients group, 12.2%, recurrent thrombotic CVI occurs statistically significantly more often than in patients of the middle age group 25.5% (p=0.036), as well as lacunar infarction 14.3%, than in the middle age group 4.2%, and the oldest group 2.7% (p=0.0002), as well as transient ischemic attack with 20.4%, than in elderly patients 4.5% and oldest patients 1.9% (p<0.001) (Table 3).

Table 3. Age distribution of the study population.

	15-45		46-75		76-	
ISCHEMIC CEREBROVASCULAR INSULT						
By type of thrombosis	14	28.6%	337	33.2%	144	22.9%
By type of embolism	1	2.0%	65	6.4%	74	11.7%
By type of thromboembolism	0	0.0%	1	0.1%	0	0.0%
By type of lacunar infarction	7	14.3%	43	4.2%	17	2.7%
With hemorrhagic component	2	4.1%	16	1.6%	18	2.9%
Recurrent by type of thrombosis	6	12.2%	259	25.5%	161	25.6%
Recurrent by type of embolism	1	2.0%	95	9.4%	105	16.7%
Recurrent by type of thromboembolism	0	0.0%	0	0.0%	1	0.2%
Recurrent by type of lacunar infarction	2	4.1%	33	3.3%	15	2.4%
Recurrent with hemorrhagic compoment	0	0.0%	10	1.0%	5	0.8%
Total ischemic CVI	**33**	**67.3%**	**859**	**84.6%**	**540**	**85.7%**
HEMORRHAGIC CEREBROVASCULAR INSULT						
Intracerebral hemorrhage	5	10.2%	96	9.5%	70	11.1%
Subarachnoid hemorrhage	0	0.0%	2	0.2%	2	0.3%
Recurrent intracerebral hemorrhage	0	0.0%	5	0.5%	5	0.8%
Total hemorrhagic CVI	**5**	**10.2%**	**103**	**10.1%**	**77**	**12.2%**
TRANSIENT ISCHEMIC ATTACK						
Transient ischemic attack	10	20.4%	46	4.5%	12	1.9%
Recurrent transient ischemic attack	1	2.0%	7	0.7%	1	0.2%
Total transient ischemic attack	**11**	**22.4%**	**53**	**5.2%**	**13**	**2.1%**
TOTAL STROKE	**49**	**100.0%**	**1,015**	**100.0%**	**630**	**100.0%**

Multiple symptoms of the occurrence of stroke in patients were registered, where motor deficit, with 61.0%, is the leading symptom compared to other symptoms (Table 4).

Table 4. Registered symptoms of stroke.

Type of stroke	Motor deficit	Speech disorders	Disorder of consciousness	Vertigo	Headache	Walking uncertainty	Sensory disorders	Visual disturbances	Vomiting	Nausea	General weakness	Epileptic seizure	Other symptoms
ISCHEMIC CEREBROVASCULAR INSULT													
By type of thrombosis	277	192	81	77	60	52	44	26	41	30	27	11	6
By type of embolism	114	96	18	4	8	2	1	2	3	1	5	2	1
By type of thromboembolism	0	0	1	0	0	0	0	0	0	0	0	0	0
By type of lacunar infarction	17	11	18	22	11	11	5	6	4	8	11	1	1
With hemorrhagic component	15	12	12	3	5	1	0	2	2	1	2	1	0
Recurrent by type of thrombosis	290	168	62	26	36	34	14	23	25	13	20	19	3
Recurrent by type of embolism	146	95	33	7	4	8	2	5	9	2	5	7	1
Recurrent by type of thromboembolism	1	0	0	0	0	1	0	0	0	0	0	0	0
Recurrent by type of lacunar infarction	28	9	19	11	7	6	11	4	4	3	3	1	0
Recurrent with hemorrhagic compoment	7	6	4	3	3	1	0	0	0	2	0	0	0
Total ischemic CVI	**895**	**589**	**248**	**153**	**134**	**116**	**77**	**68**	**88**	**60**	**73**	**42**	**12**
HEMORRHAGIC CEREBROVASCULAR INSULT													
Intracerebral hemorrhage	95	62	43	4	32	1	10	3	9	8	6	7	0
Subarachnoid hemorrhage	3	2	1	0	1	0	0	0	1	0	0	0	0
Recurrent intracerebral hemorrhage	5	3	3	0	0	0	0	0	1	0	1	0	0
Total hemorrhagic CVI	**103**	**67**	**47**	**4**	**33**	**1**	**10**	**3**	**11**	**8**	**7**	**7**	**0**
TRANSIENT ISCHEMIC ATTACK													
Transient ishemic attack	31	30	11	6	10	3	14	7	4	4	1	0	2
Recurrent transient ishemic attack	5	3	2	0	1	0	3	0	0	0	0	0	0
Total transient ischemic attack	**36**	**33**	**13**	**6**	**11**	**3**	**17**	**7**	**4**	**4**	**1**	**0**	**2**
TOTAL STROKE	**1,034**	**689**	**308**	**163**	**178**	**120**	**104**	**78**	**103**	**72**	**81**	**49**	**14**

The most represented risk factor was arterial hypertension (80.0 %), which is also the most statistically significant risk factor for stroke compared to other risk factors recorded by this study (p<0.001), followed by previous stroke and/or transient ischemic attack (42.0 %), coronary disease (35.4 %), diabetes mellitus (29.9 %), heart rhythm disorder (25.6 %), dyslipidemia (20.6 %), smoking (20.1 %), cardiomyopathy (18.2 %) (Table 5).

Table 5. Stroke risk factors.

Type of stroke	Arterial hypertension	Heart rhythm disorder	Coronary disease	Cardiomyopathy	Diabetes mellitus	Smoking	Dyslipidemia	Alchohol	Previous stroke and/or TIA	Family anamnesis of stroke
ISCHEMIC CEREBROVASCULAR INSULT										
By type of thrombosis	383	45	191	85	144	127	108	14	0	5
By type of embolism	111	100	39	37	40	13	22	3	0	2
By type of thromboembolism	0	0	0	0	0	0	0	0	0	0
By type of lacunar infarction	45	12	29	6	12	12	19	1	0	2
With hemorrhagic component	28	20	18	5	12	3	6	0	0	0
Recurrent by type of thrombosis	358	62	135	73	148	104	105	11	426	8
Recurrent by type of embolism	167	141	70	62	68	25	23	2	201	6
Recurrent by type of thromboembolism	1	1	1	0	0	0	0	0	1	0
Recurrent by type of lacunar infarction	39	6	17	6	16	5	16	0	50	2
Recurrent with hemorrhagic compoment	17	3	9	5	9	1	4	0	15	0
Total ischemic CVI	**1,149**	**390**	**509**	**279**	**449**	**290**	**303**	**31**	**693**	**25**
HEMORRHAGIC CEREBROVASCULAR INSULT										
Intracerebral hemorrhage	148	27	58	17	40	28	21	5	0	1
Subarachnoid hemorrhage	1	0	0	1	0	0	0	0	0	0
Recurrent intracerebral hemorrhage	7	1	2	2	4	0	1	0	10	0
Total hemorrhagic CVI	**156**	**28**	**60**	**20**	**44**	**28**	**22**	**5**	**10**	**1**
TRANSIENT ISHEMIC ATTACK										
Transient ishemic attack	46	14	24	9	12	19	20	5	0	2
Recurrent transient ishemic attack	5	2	6	0	2	4	4	0	9	0
Total transient ischemic attack	**51**	**16**	**30**	**9**	**14**	**23**	**24**	**5**	**9**	**2**
TOTAL STROKE	**1,356**	**434**	**599**	**308**	**507**	**341**	**349**	**41**	**712**	**28**

The majority of patients hospitalized due to stroke are retired persons, accounting for 72.4 %, which is expected, having the pensioners as the oldest group of residents (which is the most represented with stroke suffering patients), the second most represented category are employees/ working age patients with 13.5 % of the total number of patients hospitalized due to stroke, and housewives with 11.7 % are in third place (Figure 1).
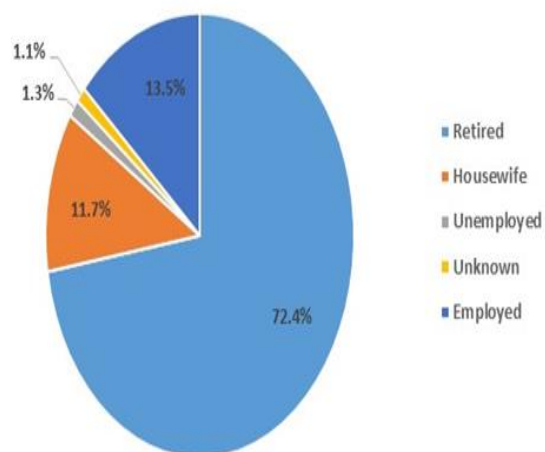

Chart 1. Employment status of the study population.

Distributed by profession, most commonly, patients affected with stroke are sales persons, accounting for 17.1 %, then drivers, making 5.7

%, and economists 5.3 %. Thrombosis and recurrent thrombosis, with 54.3 %, is the leading cause of strokes in the observed period, while patients, according to the professions and the leading cause of stroke are sales persons with 82 % and drivers with 76.9 %, statistically highly significantly affected by strokes with thrombosis and with recurrent thrombosis compared to economists in whom thrombosis participates with 25.0 % (p<0.001).

The majority of the patients comes from urban areas, 85.1 % (74.6 % from Sarajevo). Patients residing in urban areas are highly, statistically significantly more represented as patients suffering from ischemic CVI than patients from rural areas (80.9 %), as well as with recurrent stroke with 26.4 % compared to patients coming from rural areas who account for 17.4 % (p<0.01). Patients coming from rural areas are highly statistically significantly more represented as patients with hemorrhagic CVI 17% compared to patients from urban areas 10.0 % (p=0.003), as well as patients with intracerebral hemorrhage 14.8 % compared to patients from populated areas with 9.4 % (p=0.011) (Table 6).

Table 6. Structure of study population in respect to the place of residence.

Type of stroke	Rural		Urban		Unknown	
By type of thrombosis	65	28.3%	430	29.4%	6	26.1%
By type of embolism	25	10.9%	115	7.9%	3	13.0%
By type of thromboembolism	0	0.0%	1	0.1%	0	0.0%
By type of lacunar infarction	7	3.0%	60	4.1%	1	4.3%
With hemorrhagic component	6	2.6%	30	2.0%	0	0.0%
Recurrent by type of thrombosis	40	17.4%	386	26.4%	6	26.1%
Recurrent by type of embolism	28	12.2%	173	11.8%	3	13.0%
Recurrent by type of thromboembolism	1	0.4%	0	0.0%	0	0.0%
Recurrent by type of lacunar infarction	11	4.8%	39	2.7%	0	0.0%
Recurrent with hemorrhagic compoment	3	1.3%	12	0.8%	0	0.0%
Total ischemic CVI	**186**	**80.9%**	**1,246**	**85.1%**	**19**	**82.6%**
Intracerebral hemorrhage	34	14.8%	137	9.4%	3	13.0%
Subarachnoid hemorrhage	1	0.4%	3	0.2%	0	0.0%
Recurrent intracerebral hemorrhage	4	1.7%	6	0.4%	0	0.0%
Total hemorrhagic CVI	**39**	**17.0%**	**146**	**10.0%**	**3**	**13.0%**
Transient ishemic attack	4	1.7%	64	4.4%	1	4.3%
Recurrent transient ishemic attack	1	0.4%	8	0.5%	0	0.0%
Total transient ischemic attack	**5**	**2.2%**	**72**	**4.9%**	**1**	**4.3%**
TOTAL STROKE	**230**	**100.0%**	**1,464**	**100.0%**	**23**	**100.0%**

The incidence of stroke is almost the same for all of seasons. Ischemic CVI deviate in the spring. A statistically significant deviation was observed in the case of transient ischemic attack with an evidently significant increase in the number of patients in the spring of 2014 (18 patients) compared to the spring of 2013 (9 patients) (p=0.023). In the case of intracerebral hemorrhage, as the most represented type of hemorrhagic CVI, most patients are represented in winter (Table 7).

Table 7. Frequency of stroke in the study population, in respect to the season.

Type of stroke	Spring		Summer		Autumn		Winter	
By type of thrombosis	130	29.3%	127	30.6%	103	25.5%	135	31.3%
By type of embolism	26	5.9%	38	9.2%	34	8.4%	42	9.7%
By type of thromboembolism	0	0.0%	0	0.0%	0	0.0%	1	0.2%
By type of lacunar infarction	17	3.8%	17	4.1%	15	3.7%	18	4.2%
With hemorrhagic component	7	1.6%	13	3.1%	9	2.2%	7	1.6%
Recurrent by type of thrombosis	114	25.7%	111	26.7%	118	20.2%	83	19.2%
Recurrent by type of embolism	47	10.6%	45	10.8%	54	13.4%	55	12.7%
Recurrent by type of thromboembolism	0	0.0%	0	0.0%	0	0.0%	1	0.2%
Recurrent by type of lacunar infarction	20	4.5%	3	0.7%	10	2.5%	17	3.9%
Recurrent with hemorrhagic compoment	2	50.0%	5	1.2%	3	0.7%	5	1.2%
Total ischemic CVI	**363**	**81.9%**	**359**	**86.5%**	**346**	**85.6%**	**364**	**84.3%**
Intracerebral hemorrhage	44	9.9%	35	8.5%	38	9.4%	54	12.5%
Subarachnoid hemorrhage	3	0.7%	0	0.0%	1	0.2%	0	0.0%
Recurrent intracerebral hemorrhage	4	0.9%	2	0.5%	3	0.7%	2	0.2%
Total hemorrhagic CVI	**51**	**11.5%**	**37**	**8.9%**	**42**	**10.4%**	**55**	**12.7%**
Transient ishemic attack	27	6.1%	15	3.6%	15	3.7%	11	2.5%
Recurrent transient ishemic attack	2	0.5%	4	1.0%	1	0.2%	2	0.5%
Total transient ischemic attack	**29**	**6.5%**	**19**	**4.6%**	**16**	**4.0%**	**13**	**3.0%**
TOTAL STROKE	**443**	**100.0%**	**415**	**100.0%**	**404**	**100.0%**	**432**	**100.0%**

The most frequent outcome of a stroke, as recorded by this study, is complete independence of the patient with milder consequences (62.0 %), the second most common outcome is death (19.3 %), while the third place ranked are the patients affected with permanent disability and dependence on others (18.9 %). According to the age, in year 2014, outcome of permanent disability and dependence on others increased for ischemic CVI (30.9 %) patients , when compared to year of 2013 (8.5 %), as well as in hemorrhagic CVI (27.2 %) when compared to 2013 (5.4 %), while the percentage of complete independence with milder consequences in patients with ischemic CVI decreased from 76.3 % , year 2013, to 51.8 % in year 2014, which is statistically significant ($p<0.001$) and in hemorrhagic CVI from 53.8 % in 2013 to 38.0 % in 2014, which is highly statistically significant ($p<0.001$). In case of recurrent transient ischemic attack, death occurred in 11.1 % of the cases (1 out of 9 patients), which indicates its importance (Figure 2).
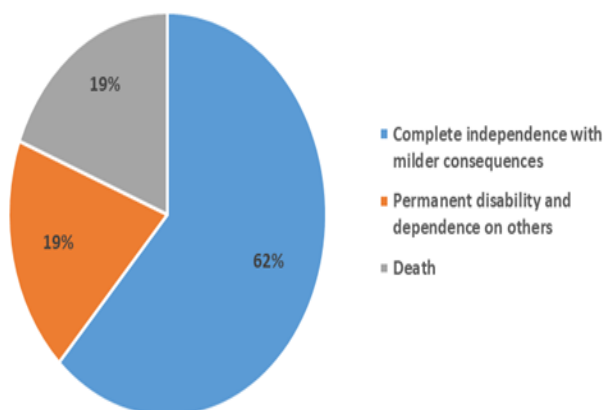
Figure 2. Outcome of stroke for the study population

A total of 27.8 % of hospitalized patients have undergone diagnostic procedures; in 35.7 % of the tested, the results were normal, while with the rest, there were atherosclerotic changes found, most prevalent with patients affected by ischemic CVI by type of embolism (76.9 %), then with patients suffering recurrent insults by type of thrombosis (71.2 %), and then the ones affected by type of thrombotic insult (69.1 %). Ischemic CVI by type of lacunar infarction was statistically significantly more common in patients with atherosclerotic changes in 2013 (71.4 %) than in 2014 (p=0.018). The conducted study determines that, most commonly, it is atherosclerotic changes with stenosis up to 90 %, occlusion, and reduced values of mean blood flow velocity (MBV). The changes are most pronounced with the internal carotid arteries (ACI), in the artery vertebralis (AV), and artery basilaris (AB). As for the circle of Willis, the most commonly affected ones are the middle cerebral artery (ACM), as well as the anterior cerebral artery (ACA) and the posterior cerebral artery (ACP) (Table 8).

- Complete independence with milder consequences
- Permanent disability and dependence on others
- Death

Table 8. Presence of atherosclerotic changes.

Type of stroke	Normal results		Presence of atherosclerotic changes		Total procedures
By type of thrombosis	56	30.9%	125	69.1%	181
By type of embolism	3	23.1%	10	76.9%	13
By type of thromboembolism	1	50.0%	1	50.0%	2
By type of lacunar infarction	24	54.5%	20	45.5%	44
With hemorrhagic component	2	50.0%	2	50.0%	4
Recurrent by type of thrombosis	30	28.8%	74	71.2%	104
Recurrent by type of embolism	6	40.0%	9	60.0%	15
Recurrent by type of thromboembolism	0	0.0%	1	100.0%	1
Recurrent by type of lacunar infarction	11	39.3%	17	60.7%	28
Recurrent with hemorrhagic compoment	0	0.0%	0	0.0%	0
Total ischemic CVI	**133**	**33.9%**	**259**	**66.1%**	**392**
Intracerebral hemorrhage	3	75.0%	1	25.0%	4
Subarachnoid hemorrhage	0	0.0%	0	0.0%	0
Recurrent intracerebral hemorrhage	0	0.0%	0	0.0%	0
Total hemorrhagic CVI	**3**	**75.0%**	**1**	**25.0%**	**4**
Transient ishemic attack	28	43.8%	36	56.3%	64
Recurrent transient ishemic attack	4	36.4%	7	63.6%	11
Total transient ischemic attack	**32**	**42.7%**	**43**	**57.3%**	**75**
TOTAL STROKE	**168**	**35.7%**	**303**	**64.3%**	**471**

DISCUSSION

During the study period, stroke patients accounted for 39.8% of the total number of hospitalized patients. The inflow of patients for each observed year was at approximately the same level, with an increase of 78 patients in year 2014. According to the WHO, one in six people will experience CVI during their lifetime (9). Kantardžić states that ischemic CVIs accounts for over 80.0% of all insults in Western Europe, which corresponds with the results obtained by this study, while in the countries of Eastern Europe and the Far East, hemorrhagic insults accounts for as much as 35.0% of insults, which is three times more than found by this study (6). Veličković states that the number of patients in neurological clinics (and departments) ranges from 30 to 70% of all the patients (3). Comparing the results from 1956, he sees that every 16th patient shows signs of CVI (6.2%), while nowadays this is the case with almost every third hospitalized patient (33.0%), which indicates a significant increase of the inflow of patients with stroke during the observed period of this study, when compared to 60 years ago (3).

In the United States of America (USA), about 700,000.00 people suffer a stroke each year, with 200,000.00 are the recurrent ones. The number of people with a transient ischemic attack is estimated to be significantly higher, according to Sacco et al. (10). According to Hickey and Todd, from 2003, 87.0% of all strokes are ischemic, and 13.0% are hemorrhagic CVIs (11), which is close to the results of this study. According to Lausanne, among ischemic insults, atherothrombotic insults make up for 50-60% of all insults, embolisms of cardiac origin for 15-20%, as well as lacunar infarctions, while a small portion pertains to other causes, which is similar to the results obtained in this study, with the exception of lacunar insults (12). Dimitrijević in his study states, that in the period from 1995 to 2005, at the Clinic for Neurology of the CCUS, the group of ischemic insults shows an increase in

frequency, with it being more expressed in the subgroup of atherothrombotic strokes than for the subgroup of cerebral embolism (4).

In the observed period, the number of male and female patients with stroke did not deviate over the years, and of the total number of patients, women were affected more often (51.0%). According to Gargano's study, the number of women who experience a stroke is higher, and as the cause he states the longer life expectancy of women, as well as the fact that women are more likely to seek medical help later than men would (13, 14).

In the study sample, most patients were between the age of 46 and 75 (60.0%). It is expected that the number of stroke patients increases with age, so according to the Helsinki Young Stroke Registry, the frequency of stroke increases sharply above the age of 40, given that more variable risk factors appear (15). Veličković states that the occurance of CVB is most common in the third age of life, but in recent times the tendency of it occuring at a younger age has been shown as well (3).

The conducted study detects multiple symptoms, where motor deficit is the leading symptom with 61.0%, followed by speech disorders, disorder of consciousness, headache and vertigo.

Arterial hypertension is the most represented risk factor (80.0%), and according to study from Germany in year 2001, it is the leading risk factor with all the types of ischemic stroke (16). Most patients were with multiple risk factors for stroke: arterial hypertension, previous stroke and/or transient ischemic attack (42.0%), coronary disease (35.4%), diabetes mellitus (29.9%), heart rhythm disorder (25.6%), dyslipidemia (20.6%), smoking (20.1%), cardiomyopathy (18.2%). In 2008, Guiraud et al., who surveyed stroke development (registry of Dijon, France, period of 20 years), found that the number of patients with stroke and hypertension remained stable for that entire period (17), which indirectly indicates that the treatment of hypertension today is better and more efficient, but that it has not been done enough for its prevention. Atrial fibrillation is one of the most significant independent risk factors for stroke, increasing the incidence of stroke by approximately five times for the first stroke (18). Schreiber and Haberl found that one third of all ischemic strokes occurs due to cardiac embolism with atrial fibrillation, emphasizing the positive correlation between atrial fibrillation and the age, as well as a further increased risk of stroke if diabetes, hypertension or congestive heart attack are present (19).

In the literature, there is no occupation singled out and stated as a potential factor for stroke, but the occurrence of CVI is significantly influenced by certain habits that a person acquires at work or that are in the description of a given job. The largest number of patients from the sample comes from urban areas, 85.1%, and according to Veličković, the occurrence of CVB becomes significantly more frequent with urbanization, which is explained by the lengthening of human life, which results in "increased wear and tear" of blood vessels. According to Savićević et al., the frequency of occurrence of the CVB was 2.14 per thousand in urban areas and 1.40 per thousand in

suburban and rural areas (3), which is similar to findings of this study.

The incidence of stroke is almost the same in all seasons, and there are no significant differences by season. According to the observations of Veličković, the occurrence of CVB has an undulating flow of occurrence for certain areas, in certain (irregular) time intervals. There were extremely rare periods of time when CVB patients were recorded in the entire specified territory. This periodicity was more expressed during autumn, but he was unable to explain the mentioned phenomenon (3).

During the hospitalization, 62.0% of the patients experienced complete recovery with discrete symptoms, 19.3% of patients died, and 18.9% of patients suffered persistent symptoms. In Serbia, the mortality ranges up to 30.0% (2), which is much higher from findings of this study, while the study by Johnston and Weimer founds that 53.7% of patients restore functional independence, 46.3% did not restore it and/or had mild residual symptoms, while 13.9% of them ended fatally, which is very similar to the findings of this study (21, 22). Lavallee et al states that in developed countries, the death rate from stroke during the 1970s and 1980s decreased by approximately half, which emphasize the treatment of risk factors as a preventive measure (23). In most developing countries and countries in transition, there is a visible increase in the incidence of stroke (4). Bosnia and Herzegovina is certainly among the transition countries, where the leading cause of death in the Federation of Bosnia and Herzegovina observed in the period from 2010 to

2016 was stroke, which is in a slight decline in terms of mortality, and reached second place only in 2016, but it is still the leading cause of death in women (18).

Ultrasound diagnostic procedures (Color Doppler and TCD) were performed for 27.8% of the total number of hospitalized patients, of whom 35.7% of them had normal results, and the rest showed atherosclerotic changes. These changes are significant because for almost 20.0% of the patients with a thrombotic process, due to the growth of the thrombus in the proximal part, the clinical course is progressive when speaking about a developing insult. According to Meljničuk et al. three quarters of brain infarctions due to the thrombotic process are localized in the area of irrigation of the middle cerebral artery (ACM) (3).

CONCLUSION

Stroke patients account for 39.8%, which is a significant incidence indicator. An ischemic stroke is the prevailing type. Women have been affected more, suffering mostly from ischemic embolic stroke, and men predominantly from ischemic thrombotic stroke. An increase is observed in the number of patients from the oldest age group observed, however the same is observed in the younger population as well. The youngest patient was 18, and the oldest was 102 of age. The motor deficit has been recorded as the most represented neurological deficit, while the arterial hypertension stands as the most common risk factor. The majority of hospitalized patients belong to the retired category, the most common

profession of the affected is a sales person. Recurrent ischemic thrombotic stroke was predominantly found in patients from urban areas, while hemorrhagic CVI (was prevalent with the ones from rural areas. Ischemic CVI is more prevalent in spring and intracerebral hemorrhage in the winter. The majority of the patients recovered completely, with remaining discrete symptoms, while the fatal outcome was recorded as the second place outcome. The most common atherosclerotic changes are those with stenosis up to 90.0% and occlusion, with decrease in values of the mean blood flow velocity, and they are most represented with ischemic embolic CVI. Primary prevention measures are of the utmost importance, especially the identification and early initiation of treatment, as well as prompt transportation of the affected to medical facility, recognition of risk factors and their timely treatment.

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UČESTALOSTI KARAKTERISTIKE MOŽDANIH UDARA KOD OSOBA HOSPITALIZIRANIH NA KLINICI ZA NEUROLOGIJU KLINIČKOG CENTRA UNIVERZITETA U SARAJEVU

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SAŽETAK

Uvod: Moždani udar je daleko najčešća i najznačajnija neurološka bolest u odrasloj dobi. U tranzicijskim zemljama poput Bosne i Hercegovine moždani udar je među najčešćim uzrocima smrtnosti, zajedno sa srčanim bolestima.

Cilj: Prikazati učestalost moždanog udara kod pacijenata hospitaliziranih na Klinici za neurologiju Kliničkog Centra Univerziteta u Sarajevu (KCUS), prezentirati njihove kliničko-epidemiološke karakteristike, ukazati na važnost dijagnostičkih metoda i prepoznavanja riziko faktora za nastanak moždanog udara.

Metode: U ovoj retrospektivnoj, deskriptivnoj i kliničko-epidemiološkoj studiji prikupljeni su podaci u razdoblju od 2013. do 2015. godine. U studiji je sudjelovalo 4258 hospitaliziranih bolesnika, od kojih je 1694 pretrpjelo moždani udar. U istraživanju su korištene i analizirane historije bolesti pacijenata.

Rezultati: Najučestaliji tip moždanog udara bio je ishemijski (prosječno 84,5%), a najzastupljeniji onaj po tipu tromboze (34,6%). Motorni deficit je vodeći simptom (61%), dok je arterijska hipertenzija (80%) najzastupljeniji riziko faktor. Najveći broj oboljelih pripada kategoriji penzionera (72,4%), dok je najčešće zanimanje pacijenata trgovac (17,1%). Kod oboljelih koji dolaze iz urbanih mjesta stanovanja zastupljeniji je ishemijski, dok je kod onih iz ruralnih naseljenih mjesta zastupljeniji hemoragijskicerebrovaskularni inzult(CVI). Najčešći ishod je potpuna samostalnost sa lakšim posljedicama kod (62%), dok je statistički značajan smrtni ishod pacijenata ishemijskog CVI sa hemoragijskom transformacijom (50%).

Zaključak: Predmetna studija pokazuje evidentno povećanje broja oboljelih od moždanog udara sa starenjem, ali ni mlađa populacija nije pošteđena. I pored toga što je prevencija najbolji pristup moždanom udaru, učestalost faktora rizika je velika.

Ključne riječi: moždani udar, učestalost, faktori rizika

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