Medical Research Archives. Volume 5, issue 6. June 2017.

Trends Of Cerebrovascular Diseases At Department Of Neurology Tuzla, Bosnia And Herzegovina

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ABSTRACT

The aim of this study was to show the trends of cerebrovascular disease (CVD) in two analyzed periods at the Department of Neurology Tuzla, Bosnia and Herzegovina

Patients and methods. This retrospective study included 2363 patients with acute stroke who were hospitalized at the Department of Neurology Tuzla in the period from 2013 to 2015. Demographic data, types of stroke and mortality were analyzed in the three years period and compared with the previously analyzed period (2001-2005). The necessary data were taken from the standard history chart. The inclusion criterion was stroke confirmation with neuroimaging techniques.

Results. Out of 2363 patients with acute stroke, there were 1186 (50.2%) women and 1177 (49.8%) men without statistical significance. The average age was 70 years. Ischemic strokes (IS) were statistically more frequent in the period 2013-2015 ($p=0.02$), while intracerebral hemorrhage (ICH) was more common in the previously analyzed period (2001-2005) ($p=0.0001$). There was statistical significance in the distribution of certain types of stroke. The most frequent risk factors were hypertension, hyperlipidemia and diabetes mellitus. The mortality for all types of stroke, and the total in-hospital mortality were lower in comparison to the previously analyzed period (2001-2005).

Conclusion. Improved diagnostic procedures lead to a different distribution of stroke subtypes. In the three-year analysis period, the prevalence of ischemic stroke increased and the in-hospital mortality reduced. Adequate control of modifiable stroke risk factors may help to reduce the occurrence of stroke.

Key words: stroke, prevalence, mortality

INTRODUCTION

Cerebrovascular diseases (CVD) are the leading cause of morbidity and mortality worldwide (1). The World Health Organization calculated that there were 6.7 million deaths caused by stroke in 2012, and stroke is the second cause of death worldwide (2). According to TOAST (Trial of Org 10172 in Acute Stroke Treatment) criteria, there are five subtypes of ischemic stroke (IS): large artery-atherosclerosis, cardioembolic stroke, occlusion of small cerebral blood vessels, stroke due to other etiologies and stroke of unknown etiology (3). According to some authors, ASCO classification is a better method for etiological classification of stroke (A - atherosclerosis, S - small vessel disease, C - cardiac source, O - other causes) (4). It is known that there are two main groups of stroke risk factors: modifiable and non-modifiable. Non-modifiable factors are age, sex, race, heritage, and modifiable factors are hypertension, diabetes, heart disease and smoking. More recently described risk factors and triggers of stroke include inflammatory disorders, infection, pollution, and cardiac atrial disorders independent of atrial fibrillation. Single-gene disorder may cause rare, hereditary disorder for which stroke is a primary manifestation. Recent research also suggests that common and rare genetic polymorphisms can influence risk of more common causes of stroke, due to both other risk factors and specific stroke mechanisms, such as atrial fibrillation. Genetic factors, particularly those with environmental interactions, may be more modifiable than previously recognized. Stroke prevention has generally focused on modifiable risk factors. Lifestyle and behavioural modification, such as dietary changes or smoking cessation, not only reduces stroke risk, but also reduces the risk of other cardiovascular diseases. Other prevention strategies include identifying and treating medical conditions, such as hypertension and diabetes mellitus, which increase stroke risk (5).

The aim of our study was to show the trends of CVD in the two analyzed periods at the Department of Neurology Tuzla, Bosnia and Herzegovina.

PATIENTS AND METHODS

This retrospective study included 2363 patients with acute stroke who were hospitalized at the Department of Neurology, Tuzla, in the period from 2013 to 2015. The data were taken from the standard history chart. The study was approved by the Ethical Committee of the University Clinical Centre Tuzla. Medical records were used in the study. The patients' identity was protected, and written consent was not required. The inclusion criterion was stroke confirmation with neuroimaging techniques. Furthermore, the patients with unknown stroke etiology were included in the study because they were with clinical characteristic of stroke but there was no computed tomography (CT) confirmation. The reasons for not performing CT included severe general condition, cardiovascular failure, and sometimes technical problems (defect of CT). Duration of hospitalization of these patients was only a few hours and all of them deceased. Demographic data (age, sex), stroke risk factors (hypertension, diabetes mellitus, heart diseases, atrial fibrillation, smoking, and alcohol abuse),

types of stroke (ischemic stroke, intracerebral and subarachnoidal hemorrhage) and the in-hospital mortality were analyzed for all patients. Risk factors were included even if present before or after stroke diagnosis.

The patients were considered to be hypertensive if they had elevated blood pressure (> 140/90 mmHg). The heart disease group consisted of heart diseases such as angina pectoris, cardiomyopathy, hypertensive heart disease and heart rhythm disorders. Atrial fibrillation was considered as a separate risk factor, independent of other heart disorders, and it was confirmed by a specialist of internal medicine based on clinical examination and electrocardiogram. Hyperlipidemia was defined as the total serum cholesterol higher than 5.0mmol/l, low-density lipoprotein higher than 3.0mmol/l, and triglycerides higher than 2.0mmol/l. The patients were considered to be smokers if they smoked more than 10 cigarettes per day in the last six months (6). Stroke was verified by CT, and the etiology of IS was made according to the TOAST criteria (3).

The hi-square test was used for the statistical analysis, and $p < 0.05$ was considered as statistically significant.

RESULTS

Out of the total number of patients (2363) with acute stroke, there were 1186 (50.2%) women and 1177 (49.8%) men, without statistical significance. The mean age was 70 years. Table 1 shows the distribution of stroke subtypes that were analyzed in two periods (2001-2005 and 2013-2015). There is statistical significance in the prevalence of IS (p=0.02) and ICH (p=0.0001).

Table 1. Prevalence of certain types of stroke in two analyzed periods

Types of stroke	2013-2015 (n=2363)		2001-2005 (n=3864)		
	N	%	N	%	p
IS	1899	80.4	2833	73.3	0.02
ICH	267	11.3	612	15.8	0.0001
SAH	98	4.1	163	4.2	0.9
US	100	4.2	256	6.6	0.0002

IS – ischemic stroke; ICH – intracerebral hemorrhage; SAH – subarachnoidal hemorrhage; US – unknown stroke

The most common stroke risk factors are hypertension, diabetes mellitus, hyperlipidemia and alcohol abuse (table 2).

Table 2. Prevalence some of stroke risk factors

Risk factors	2013-2015 (n=2363)		2001-2005 (n=3864)		
	N	%	N	%	p
Hypertension	1925	81	2697	70	**0.0001**
Diabetes mellitus	794	33	800	21	**0.0001**
Heart diseases	866	36	1547	40	0.08
Atrial fibrillation	383	16	563	14	0.1
Hyperlipidemia	949	40	416	11	**0.0001**
Smoking	583	25	1071	28	**0.04**
Alcohol abuse	381	16	317	8	**0.0001**

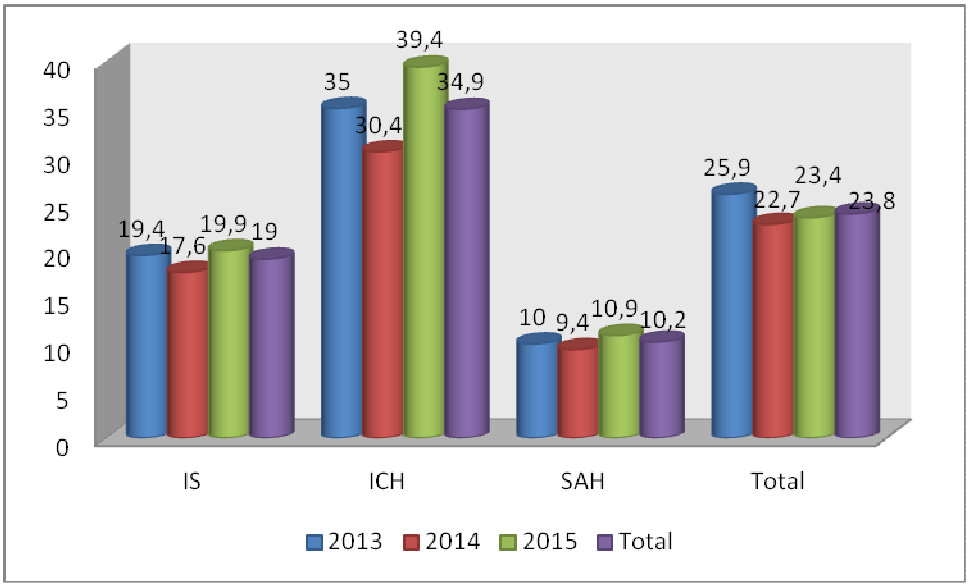
According to the prevalence of certain types of IS, there are significant differences in these two analyzed periods (table 3). Atherosclerotic type (p=0.0001) and stroke of other cause (p=0.0001) were statistically more frequent in this study, but cardioembolic (p=0.0001) and lacunar (p=0.0001) were more frequent in the previously analyzed period.

Table 3. Prevalence of certain types of ischemic stroke in two analyzed periods

Types of IS	2013-2015 (n=1899)		2001-2005 (n=2833)		
	N	%	N	%	p
Atherosclerotic	1171	61.6	973	34.5	0.0001
Cardioembolic	235	12.4	533	18.8	0.0001
Lacunar	164	8.6	936	33.0	0.0001
Other cause	128	6.7	41	1.4	0.0001
Unknown cause	201	16.9	350	12.3	0.1

Figure 1 indicates the trends of the in-hospital mortality for all types of stroke and shows a decrease in the total mortality in three years (23.8%) compared with the previously analyzed period (2001 to 2005) when it was 29.6%. For the period 2013-2015, the mortality trends of IS ranged from 19.4% to 19.9% (average 19.0%), while

from 2001 to 2005 they ranged from 25.6% - 15.2% (average 20.6%). ICH mortality trends in the period between 2013 and 2015 ranged from 35.0% to 39.4% (average 34.9%), and from 2001 to 2005 they were between 49.3% and 39.1% (average 43.8%). Over the period 2013-2015, the trends of the overall in-hospital mortality were from 25.9% to 23.4% (average 23.8%), while in the previously analyzed period (2001-2005) they were higher and ranged between 37.0% and 22.4% (average 29.6%).



IS – ischemic stroke; ICH – intracerebral hemorrhage; SAH – subarachnoidal hemorrhage

Figure 1. Hospital mortality in the period 2013-2015 at Department of Neurology Tuzla

DISCUSION

In the period 2013-2015, at the Department of Neurology Tuzla, IS was significantly more frequent than in the previously analyzed period (p=0.02) (2001 to 2005), but a significant reduction in the prevalence of ICH was noticed too (p=0.0001) (7). An increased prevalence of ICH is a consequence of the high prevalence of the leading risk factor for ICH, hypertension (81%). In some studies, the prevalence and mortality rate from stroke were reduced (8, 9). As for our Department, the number of hospitalized patients with stroke has increased in recent years in comparison to previous years and the reason is the increased level of enlightenment of the population.

One Portuguese study (2017) analyzed the changes in incidence and outcome of patients after stroke. Their results showed a reduction in the incidence and a better outcome during the specified period of time. Stroke incidence decreased by 23%, from 261 to 203/100 000 after adjustment for the Portuguese population. Significant reduction was found in those aged <75 years (31%) and in women (32%). Incidence of disabling strokes was reduced by 29%. Fatal strokes

decreased by 46%, while intracerebral hemorrhage decreased by 51% (10).

The most common stroke risk factors were hypertension (81%), hyperlipidemia (40%), heart disease (36%) and diabetes mellitus (33%), while in the period from 2001 to 2005 hypertension was also more common (70%), followed by heart diseases (40%), smoking (28%) and diabetes mellitus (21%) (7).

This distribution of risk factors can be explained by a better detection of risk factors, the use of detailed laboratory tests, which were not routinely done in the past. According to the new protocols in our clinic, each patient with a stroke has to do all the necessary tests, including a lipid test, which was not the case before. This may explain a high prevalence of hyperlipidemia in this study (42% vs. 11%).

In other studies, the leading risk factor is hypertension, followed by diabetes and hyperlipidemia, which are rising in the recent years (11, 12). In the study by Khan et al., the majority of patients had multiple risk factors which included hypertension (65%), smoking (32%), diabetes mellitus (36.3%), dyslipidemia (32.7%), coronary artery disease (9%), obesity (18%), epilepsy (16.3%) and left ventricular hypertrophy (3.6%) (13). Hypertension was the leading risk factor with a prevalence of 78.1%, followed by diabetes (62.7%), hyperlipidemia (54.8%) and ischemic heart disease (24.2%) (14). The prevalence of certain risk factors in the previously mentioned study is similar to the results of our study**.**

Atherosclerotic strokes were significantly more frequent (61.6%) (p=0.0001) in comparison to the previously analyzed period (34.5%). Better diagnostic procedures of other causes of stroke (detailed laboratory tests, ultrasound, echocardiography) is one of the reasons of different distribution of IS subtypes. Moreover, the distribution of stroke risk factors is one of the reasons for the prevalence of certain subtypes of IS. In recent years, every patient with stroke has been required to do color Doppler ultrasound test, and then, if necessary, CT angiography or MRA (magnetic angiography) of the head and neck, blood tests (the detection of Fabry disease, coagulopathy), transthoracic and transesophageal ultrasound, to confirm cryptogenic stroke.

In the study by Zafar et al., the most common etiological type of IS has been occlusion of small cerebral blood vessels (32.1%), followed by cardioembolic type (21.9%) and large artery atherosclerosis (14.6%) (14).

In the analyzed period from 2013 to 2015, the reduced mortality was noted (23.8%), in comparison to the previous five-year period (29.6%). In the period between 2013 and 2015, the mortality ranged from 25.9% to 23.4%, and in previous five years it was from 37% to 22.4%. It is thought that one of the reasons why the mortality reduced in our Department in the analyzed period is the forming of the Stroke Unite 10 years ago and beginning with the administration of thrombolytic therapy. It can also be justified by the reduction of the mortality from the IS from 20.6% to 19%. However, the mortality from ICH still remains high (34.9%), although it was greater in the previous period (43.8%). The reason for the continuing high mortality from ICH is that we do not have any specific therapy and a very small number of intracerebral

hemathomas (posterior fossa) are treated surgically.

It can be stated that there is a false decrease in the mortality from subarachnoidal hemorrhage (SAH) because each patient with verified aneurysm in intracranial blood vessels is transferred to the Department of Neurosurgery for the intervention (endovascular embolisation or surgical intervention). This further reduced the mortality from SAH, which caused the decrease of the total mortality. One of the limitations of our study is that the final outcome of the patients with SAH is unknown to us, because they were transferred to another clinic. The second limitation is that we still have patients with unknown stroke etiology.

CONCLUSION

Improved diagnostic procedures lead to a different distribution of stroke subtypes. In the three-year analysis period, the prevalence of ischemic stroke increased and the in-hospital mortality reduced. Adequate control of modifiable stroke risk factors may help to reduce the occurrence of stroke.

References

1. Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2197-2223.
2. World Health Organization. WHO Health statistics and information systems. http://www.who.int/healthinfo/global_burden_disease/en/ (assessed Aug 10, 2015).
3. Adams HP Jr, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, et al. Classification of subtype of acute ischemic stroke. Stroke 1993; 24: 35-41
4. Garcia SP, Garcia PA, Garcia AA, Vicente PG, Rodriguez CPM, Perez SJR, Diaz OF, Vazquez AP, Villanueva OJA, Gil Nunez A. Aetiological classification of ischemic strokes: comparison of the new A-S-C-O classification and the classification by the Spanish Society of Neurology's cerebrovascular disease study group. Neurologia 2013; 28 (7): 417-424.
5. Boehme AK, Esenwa C, Elkind MS. Stroke risk factors, genetics and prevention. Circ Res 2017; 120 (3): 472-495.
6. Goldstein LG, Bushnell CD, Adams RJ, Appel LJ, Braun LT, Chaturvedi S, Creager MA, Culebras A, Eckel RH, Hart RG, Hinchey JA, Howard VJ, Jauch EC, Levine SR, meschia JF, Moore WS, Nixon JV, Pearson TA. AHA/ASA guideline. Guidelines for the primary prevention of Stroke. Stroke 2011; 42: 517-584.
7. Salihovic D, Smajlovic Dz, Sinanovic O. Reduction of stroke mortality in the Tuzla region, Bosnia and Herzegovina. Neurosciences 2009; Vol 14 (3): 230-233.
8. Ovbiagele B. Nation wide trends in in-hospital mortality among patients with stroe. Stroke 2010; 41: 1748-1754.
9. Fang MC, Parraillon MC, Ghosh K, Cutler DM, Rosen AB. Trends in stroke rates, risk, and outcomes in the Unitedd States 1988-2008. Am J Med 2014; 127 (7): 608-615.
10. Correia M, Magalhaes R, Felgueiras R, Quintas C, Guimaraes L, Silva MC. Changes in stroke incidence, outcome, and associated factors in Porto between 1998 and 2011. Int J Stroke 2017; 12 (2): 169-179.
11. Niewada M, Skowronska M, Ryglewicz D, Kaminski B, Clonkovska A; Polish national Stroke Prevention and Treatment Collaborative Group Acute Ischemic stroke care and otucome in centers participating in the Polish National Stroke Prevention and Treatment Registry. Stroke 2006; 37: 1837-1843.
12. Kim YD, Jung YH, Saposnik G. Traditional risk factors for stroke in East Asia. J Stroke 2016; 18 (3): 273-285.
13. Khan NI, Naz L, Mushtaq S, Rukh L, Ali S, Hussain Z. Ischemic stroke: prevalence of modifiable risk factors in male and female patients in Pakistan. Pak J Pharm Sci 2009; 22 (1): 62-67.
14. Zafar A, Al-Khamis FA, Al-Bakr A, Alsulaiman AA, Msmar AH. Risk factors and subtypes af acute ischemic stroke. A study at King Fahd Hospital of the University. Neurosciences 2016; 21 (3): 246-251.