

Reduction of stroke mortality in the Tuzla region, Bosnia and Herzegovina

Denisa O. Salihović, MD, Dževdet M. Smajlović, MD, PhD, Osman I. Sinanović, MD, PhD.

ABSTRACT

الأهداف: تحليل عوامل الخطر، الجنس، العمر، ونسبة الوفيات بالمستشفى عند المرضى في مختلف أنواع الجلطات الدماغية.

الطريقة: أجريت دراسة تم فيها مراجعة سجلات طبية لـ 3864 مريض ممن تم استقبالهم كأول حالات جلطة دماغية في قسم الأمراض العصبية - المستشفى المركزي الجامعي - بتوزلا - البوسنة والهرسك، خلال الفترة ما بين يناير 2001م وحتى ديسمبر 2005م.

النتائج: من العدد الإجمالي للمرضى، 2833 حالة (73.3%) كان لديهم نقص التروية الدماغية (IS)، تم تسجيل 612 حالة (15.8%) لديهم نزيف دموي بالدماغ (ICH)، و 163 حالة (4.2%) لديهم نزيف الأم الجافية (SAH)، و 256 حالة (6.6%) أسباب غير معروفة. متوسط العمر كان (68±10) عام للنساء، و (65±11) عام للذكور (p=0.000). بشكل عام كانت نسبة النساء 2045 (53%) (p=0.000). النساء كانت لديهن الحالات العظمى للجلطة القلبية (21.7% مقابل 15.6%) (p=0.000)، الذكور كان لديهم الحالات العظمى من تصلب الشرايين نوعية الجلطة الدماغية (37.4% مقابل 31.6%) (p=0.000). العوامل الرئيسية المسببة كان: ارتفاع ضغط الدم (70%)، الأمراض القلبية (40%)، التدخين (28%) وأمراض السكري (21%). إجمالي حالات الوفاة في المستشفى كان (29.6%)، الوفاة الناتجة عن (IS) نسبتها (20.6%)، وعن (ICH) نسبتها (43.8%) وعن (SAH) نسبتها (26.4%).

خاتمة: في جميع حالات الجلطة الدماغية، كانت الإناث أكبر سناً من الذكور. كان ارتفاع ضغط الدم وأمراض القلب هي العوامل الأكثر خطراً للجلطة الدماغية، الوفاة في المستشفى كانت أقل من (30%).

Objective: To analyze the frequency, gender and age distribution, risk factors, and hospital mortality of different types of hospitalized patients with stroke.

Methods: In this retrospective study, we analyzed the hospital records of 3864 patients with first-ever stroke admitted to the Department of Neurology,

University Clinical Center Tuzla, Bosnia and Herzegovina, from January 2001 to December 2005.

Results: Out of the total number of patients, 2833 (73.3%) had ischemic stroke (IS) 612 (15.8%) intracerebral hemorrhage (ICH), 163 (4.2%) subarachnoid hemorrhage (SAH), and 256 (6.6%) had unknown stroke. The mean age was 68±10 years in females, and 65±11 years in males (p=0.000). Overall, there were 2045 (53%) women (p=0.000). Women suffered from cardioembolic stroke more than men (21.7% versus 15.6%, p=0.000), and men were more affected by atherothrombotic stroke (37.4% versus 31.6%, p=0.000). The leading stroke risk factors were hypertension (70%), heart diseases (40%), smoking (28%), and diabetes mellitus (21%). The total hospital mortality was 29.6%, and hospital mortality in patients with IS was 20.6%, ICH 43.8%, and SAH 26.4%.

Conclusion: Women are older than men in all types of stroke. The leading risk factors for both genders are hypertension and heart diseases. The hospital mortality rate is lower than 30%.

Neurosciences 2009; Vol. 14 (3): 230-233

From the Department of Neurology, University Clinical Center, Tuzla, Bosnia and Herzegovina.

Received 6th December 2008. Accepted 9th March 2009.

Address correspondence and reprint request to: Dr. Denisa O. Salihović, Department of Neurology, University Clinical Center Tuzla, Trnovac bb, 75 000 Tuzla, Bosnia and Herzegovina. Tel. +387 (61) 886673. Fax. +387 (35) 814029. E-mail: dsalibovic@yahoo.com

Stroke is a major cause of death and serious long-lasting neurological disability.¹ Women have a lower lifetime risk of stroke than men, however, because women are over-represented in the older age groups and because stroke mortality is higher with older age, women have a greater risk of dying from stroke.² Stroke, according to pathological types, is divided into ischemic stroke (IS), intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH). According to the Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification,³ there are 5 diagnostic subtypes of ischemic stroke: large artery

atherosclerosis, cardio embolism, small vessel occlusion, other determined etiology, and undetermined etiology. In 2002, according to the hospital register data, the incidence of stroke in the Tuzla region was 110/100,000 inhabitants.⁴ The risk factors for stroke are divided into non modifiable and modifiable.⁵ Non modifiable risk factors are age, gender, family history of stroke, and race/ethnicity. Well-documented modifiable risk factors are hypertension, heart diseases (particularly atrial fibrillation), diabetes mellitus, hyperlipoproteinemia, smoking, physical inactivity, asymptomatic carotid stenosis, sickle cell disease, and postmenopausal hormone therapy. Less well-documented or potentially modifiable risk factors are metabolic syndrome, alcohol abuse, hyperhomocysteinemia, drug abuse, hypercoagulability, and oral contraceptive use.⁶ During our every day activity, we observed that mortality was reduced by year, and in this study our objective was to analyze the frequency, gender and age distribution, risk factors, and hospital mortality of different stroke types in our community.

Methods. The study included 3864 patients with first-ever stroke. These patients were admitted to the Department of Neurology, University Clinical Center Tuzla, Bosnia and Herzegovina over a 5-year period from January 2001 and December 2005. The necessary data were taken from the standard history chart. This study was approved by the Ethical Committee of the University Clinical Center Tuzla, and as medical records were used and patient identity was protected, an informed consent was not required. Having first-ever stroke treated at our Department was the only inclusion criteria, and recurrent stroke was the exclusion criteria. The following stroke risk factors were analyzed: age, hypertension, heart diseases, atrial fibrillation, diabetes mellitus, hyperlipoproteinemia, smoking, and alcohol abuse. Risk factors were included even if they were present before or after stroke diagnosis. The patient was considered to be hypertensive if systolic blood pressure were higher than 140 mm Hg, and diastolic was higher than 90 mm Hg. The heart diseases group consisted of heart diseases such as angina pectoris, cardiomyopathy, hypertensive heart diseases, and heart rhythm disorders. Atrial fibrillation was considered as a separate risk factor. Hyperlipoproteinemia was defined as the total serum cholesterol higher than 5.0 mmol/l, low-density lipoprotein higher than 3.0 mmol/l, and triglycerides higher than 2.0 mmol/l. The participants were considered to be smokers if they smoked at least 10 cigarettes per day during the past 6 months.⁷ Alcohol consumption was represented by the frequency of consumption during the past 2 months, 100g per day (or higher), and/or acute alcohol intoxication 24 hours before the onset of disease.⁷ Stroke was confirmed by CT scan, and the etiology of ischemic stroke was made according

to the TOAST criteria.³ A CT scan on the SIEMENS EMOTION 6 (Siemens, Erlangen, Germany) was performed in 93.4% patients. The remaining 6.6% of patients were classified as “unknown stroke” because they had clinical characteristics of stroke, but no CT confirmation. Reasons for not performing CT included severe general conditions, cardiovascular failure and, sometimes technical problems (defect of CT). Duration of hospitalization of these patients was only a few hours and all died.

The ARCUS QUICKSTAT program,⁸ was used for statistical analyses, and the significance estimated with χ^2 (Chi-square) test. A value of $p < 0.05$ was considered to be significant.

Results. Figure 1 shows that the frequency of IS in the analyzing period increased from 63.4% in 2001 to 78% in 2005. The mean age was 68 ± 10 years in women, and 65 ± 11 years in men ($p = 0.000$), and there were 2045 (53%) women with stroke ($p = 0.000$). Women were overrepresented in all types of stroke (Table 1). Table 2 shows that hypertension, heart diseases, diabetes mellitus, and atrial fibrillation were more frequent in women, ($p = 0.000$), however, current smoking and

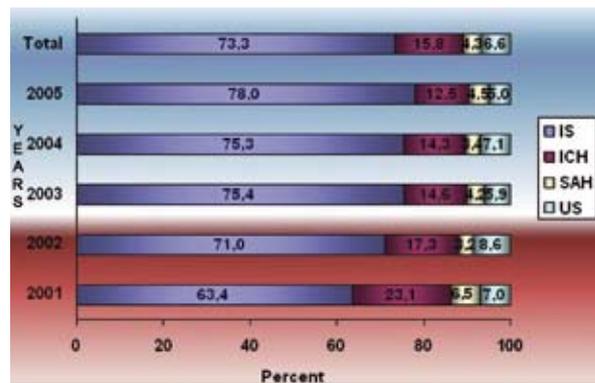


Figure 1 - Frequency of different types of stroke over the 5-year study period (2001-2005). IS - ischemic stroke, ICH - intracerebral hemorrhage, SAH - subarachnoid hemorrhage, US - unknown stroke.

Table 1 - Gender distribution of stroke patients according to type of stroke.

Type of stroke	Men (n=1819)	Women (n=2045)	Total (n=3864)
	n (%)		
IS	1349 (47.6)	1484 (52.4)	2833 (73.3)
ICH	293 (48.0)	319 (52.0)	612 (15.8)
SAH	70 (43.0)	93 (57.0)	163 (4.2)
US	107 (42.0)	149 (58.0)	256 (6.6)

IS - ischemic stroke, ICH - intracerebral hemorrhage, SAH - subarachnoid hemorrhage, US - unknown stroke

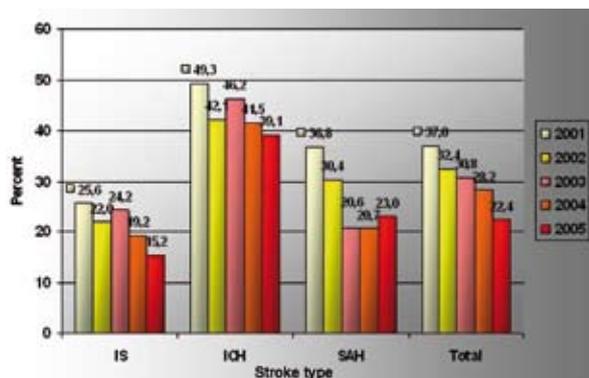
Table 2 - Frequency and gender distribution of stroke risk factors.

Risk factors	Men (n=1819)	Women (n=2045)	P-value	Total (n=3864)
Hypertension	1168 (64)	1529 (75)	0.000	2697 (70)
Heart diseases	696 (38)	851 (42)	0.16	1547 (40)
Atrial fibrillation	207 (11)	356 (17)	0.000	563 (14)
Diabetes mellitus	310 (17)	490 (24)	0.000	800 (21)
Hyperlipoproteinemia	201 (11)	215 (10)	0.64	416 (11)
Smoking	779 (42)	292 (14)	0.000	1071 (28)
Alcohol abuse	307 (17)	10 (0.5)	0.000	317 (8)
Age (mean ± SD)	65±11	68±10	0.000	66±11

Table 3 - Frequency and gender distribution of some subtypes of ischemic stroke.

Subtypes of ischemic stroke	Men (n=1349)	Women (n=1484)	Total (n=2833)
Atherothrombotic	504 (37.4)*	469 (31.6)	973 (34.3)
Lacunar	443 (32.8)	493 (33.2)	936 (33.0)
Cardioembolic	210 (15.6)	323 (21.7)*	533 (18.8)
Other etiology	25 (1.8)	16 (1.1)	41 (1.4)
Undetermined	167 (12.4)	183 (12.3)	350 (12.3)

* $p=0.000$

**Figure 2** - Hospital mortality according to the subtypes of stroke over the 5-year study period (2001-2005). IS - ischemic stroke, ICH - intracerebral hemorrhage, SAH - subarachnoid hemorrhage

alcohol abuse was higher in men ($p=0.000$). Women suffered more cardioembolic stroke than men, and men were more affected by atherothrombotic stroke (Table 3). The frequency of other types of IS was similar in both genders. Hospital mortality for IS was 25.6%, and for ICH was 49% in 2001. At the end of the study period, the hospital mortality was 10% lower in both

types of stroke. Hospital mortality for SAH decreased from 36.8% in 2001 to 23% in 2005, and total hospital mortality reduced from 37% in 2001 to 22.4% in 2005 (Figure 2).

Discussion. In the Tuzla region, almost three-quarters of all cerebrovascular diseases (CVD) are ischemic strokes. In our previous study, between 1996 and 2000, 65.1% of the patients had IS, 28.3% had ICH, and 6.6% had SAH.⁹ In our study, the leading risk factor is hypertension for all types of stroke, and is similar to the results of other studies.^{10,11} The frequency of IS in our study was higher than in the study by Dežmalj et al,¹² where ischemic stroke was verified among 66.7% of patients. Unfortunately, our data were based on the hospital register and is one of the limitations of the study. Namely, after the war in Bosnia and Herzegovina, the official stroke register was not yet formed in our region. However, most patients with stroke from Tuzla region were hospitalized at our Department, while only a small number of ischemic stroke patients (less than 50 patients per year) were hospitalized at a General Hospital. The period of admission was not measured, which might be the second limitation of this study.

Atherothrombotic IS occurs more frequently in men, while, on the other hand, cardioembolic IS in women. The reason for this discrepancy might be attributed to the gender distribution of the stroke risk factors. As in the study of Morin-Martin et al,¹³ we also found that hypertension, atrial fibrillation, and diabetes mellitus were more frequent in women, and current smoking and alcohol intake in men. In the study of Worrall et al,¹¹ hypertension was represented in 70% of stroke patients, smoking in 21%, and alcohol overuse in 9%. The distribution of stroke risk factors was different in the study by Dežmalj et al.¹² Hypertension was represented in 53% of men, smoking in 47%, hyperlipidemia in 40%, alcohol consumption in 33%, heart diseases (included cardiomyopathy, heart rhythm disorders, and atrial myxoma) in 20%, and diabetes mellitus in 7%. The most frequent risk factors in women with stroke were hyperlipidemia in 45% of patients, hypertension in 36%, heart diseases and alcohol intake in 18%.

The overall prevalence of stroke, in this study, was higher in women (53%, $p=0.000$) and women were significantly older. Smajlović et al¹⁴ reported that gender and age distribution of stroke risk factors influenced mortality and disability after stroke. In their study, mortality was higher in women (34.6% versus 28.7%, $p=0.0006$), and women had a higher degree of disability than men after the first month following the stroke. Hospital mortality during the study period was reduced significantly from 37% in the year 2001 to 22.4% in 2005. The total hospital mortality was 29.6% and it was lower than in the previously studied period (1996-2000) when it was 38%.⁹ Although stroke mortality was reduced, it is still higher than the studies from developed

countries. In the study of Bentur and Resnizky,¹⁵ 17% of patients with stroke died during hospitalization, while hospital stroke mortality rate in the study of Pereira et al¹⁶ was 5.5%. In Croatia, CVD accounted for 31.3% of total mortality of cardiovascular diseases in the year 2005.¹⁷ In the postwar period in the Western Herzegovina Canton, the hospital stroke mortality rate was 37.4%,¹⁸ and in Sarajevo was 38%.¹⁹ The number of admitted patients with CVD in our Department in the study period was similar to the previously studied period, but the mortality rate reduced. We think that the treatment of stroke as an emergency according to the Recommendations of the European Stroke Initiative (EUSI),²⁰ is one of the leading causes for reduction of stroke mortality in our region. Furthermore, at our Department of Neurology, together with the neurologist, there is active participation in the treatment of stroke patients in the acute phase by the physiatrist and speech therapist. The rehabilitation and speech therapy start during the first day of the stroke onset. Continuous education, every day nursing rounds, improvement of medical care, prevention of complications (such as decubitus, pneumonia, thrombophlebitis, falls, and urinary infections) have improved general care, and influenced mortality reduction of patients with acute stroke at our Department. Recently, we established a Stroke Unit at our Department and performed first thrombolysis. We hope that these activities will contribute to further improvement in the treatment and outcome of acute stroke patients in our region.

In conclusion, in our region, IS accounts for three-quarters of all CVD. Women are overrepresented in all types of stroke, and they are older than men. The leading risk factors for both genders are hypertension and heart diseases. The hospital mortality rate of all types of stroke is lower than 30%, and has reduced when compared with the previous 5-year period.

Acknowledgments. We would like to thank Mersad Purdić and Ismet Purdić for writing in Arabic language and Ahmed Purdić and Maamar Akriche for translation into Arabic.

References

- Hallström B, Jönsson AC, Nerbrand C, Norrving B, Lindgren A. Stroke incidence and survival in the beginning of the 21st century in Southern Sweden: comparisons with the late 20th century and projections into the future. *Stroke* 2008; 39: 10-15.
- Kapral MM, Fang J, Hill MD, Silver F, Richards J, Jaigobin C, et al. Sex differences in stroke care and outcomes: results from the Registry of the Canadian Stroke Network. *Stroke* 2005; 36: 809-814.
- 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.
- Ferković V, Sinanović O. Epidemiological characteristics of neurological diseases in Tuzla region in a period 1998-2001. *Acta Medica Saliniana* 2002; 31: 13-14.
- Romero JR. Prevention of ischemic stroke: overview of traditional risk factors. *Curr Drug Targets* 2007; 8: 794-801.
- Goldstein LB, Adams R, Alberts MJ, Appel LJ, Brass LM, Bushnell CD, et al. Primary prevention of ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council: cosponsored by the Atherosclerotic Peripheral Vascular Disease Interdisciplinary Working Group; Cardiovascular Nursing Council; Clinical Cardiology Council; Nutrition, Physical Activity, and Metabolism Council; and the Quality of Care and Outcomes Research Interdisciplinary Working Group: the American Academy of Neurology affirms the value of this guideline. *Stroke* 2006; 37: 1583-1633.
- Ruiz-Sandoval JL, Cantú C, Barinagarrementeria F. Intracerebral hemorrhage in young people: analysis of risk factors, location, causes and prognosis. *Stroke* 1999; 30: 537-541.
- Buchan I. Medicine and books. Arcus Quickstat. *BMJ* 1998; 316: 159.
- Smajlović D, Ibrahimagić O, Dostović Z, Tupković E, Sinanović O. Main Epidemiologic characteristics of cerebrovascular diseases in patients hospitalized at Tuzla Department of Neurology during a five-year post-war period (1996-2000). *Acta Clinica Croatica* 2002; 41 Suppl 3: 57.
- Niewada M, Skowronska M, Ryglewicz D, Kaminski B, Clonkowska A; Polish National Stroke Prevention and Treatment Collaborative Group. Acute ischemic stroke care and outcome in centers participating in the Polish National Stroke Prevention and Treatment Registry. *Stroke* 2006; 37: 1837-1843.
- Worrall BB, Johnston KC, Kongable G, Hung E, Richardson DJ, Gorelick PB. Stroke risk factor profiles in African-American women: an interim report from the African-American Antiplatelet Stroke Prevention Study. *Stroke* 2002; 33: 913-919.
- Dežmalj GL, Čović NR, Demarin V. Differences in the presence of risk factors for ischemic stroke in young men and women. *Liječ Vjesn* 2006; 128 (Suppl 6): S38-S39.
- Morin-Martin M, Gonzales-Santiago R, Gil-Nunez AC, Vivancos-Mora J. Women and strokes. Hospital epidemiology in Spain. *Rev Neurol* 2003; 37: 701-705.
- Smajlović D, Salihović D, Ibrahimagić O, Burina A, Sinanović O, Vidović M. Stroke in women: a hospital based study in Tuzla, Bosnia and Herzegovina. *Cerebrovasc Dis* 2006; 21: 96.
- Bentur N, Resnizky S. Care of acute stroke patients in general hospital in Israel. *Isr Med Assoc J* 2003; 5: 343-345.
- Pereira S, Coelho FB, Barros H. [Length of hospital stay, mortality and destination after discharge of stroke patients]. *Acta Med Port* 2004; 17: 187-192.
- Čorić T, Mihel S, Ivičević Uhernik A, Pristaš I. Report about died people in Croatia in 2005. Zagreb (Croatia): Institute for Public Health; 2006. p. 13.
- Vasilj I, Cavaljuga S, Lucić T, Kvesić F. [Hospital mortality of cerebrovascular insult in the Western Herzegovina Canton in the period 1998-2002]. *Med Arh* 2005; 59: 247-249. Croatian.
- Dimitrijević J, Džirlo K, Bratić M, Hrnjica M, Hebib L, Alajbegović, et al. [10-year analysis of cerebrovascular accidents at the Neurology Clinic in Sarajevo (before, during and after the war)]. *Med Arh* 2002; 56: 151-153. Croatian.
- European Stroke Initiative Executive Committee; EUSI Writing Committee, Olsen TS, Langhorne P, Diener HC, Hennerici M, Ferro J, et al. European Stroke Initiative Recommendations for Stroke Management – update 2003. *Cerebrovascular Dis* 2003; 16: 311-337.