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Incidence of Stroke and Transient Ischemic Attack in Croatia: A Population Based Study

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ABSTRACT

The aim of this population based neuroepidemiological study was to establish the real incidence rates of acute cerebrovascular disease (CVD): stroke and transient ischemic attack (TIA) in the Republic of Croatia. Multicentric study included 89 501 persons of all ages in four regional centres in Croatia: Zagreb, Osijek + Slavonski Brod, Rijeka and Split. The following incidence rates of stroke, expressed at population of 100 000, have been established: Zagreb 290.52, Osijek + Slavonski Brod 302.14, Rijeka 219.65, Split 195.82. Incidence rate of stroke for the Republic of Croatia is 251.39. The following incidence rates of TIA, expressed at population of 100 000, have been established: Zagreb 87.15, Osijek + Slavonski Brod 156.53, Rijeka 90.11, Split 59.10. Incidence rate of TIA for the Republic of Croatia is 100.55. In the continental part of Croatia (Zagreb, Osijek + Slavonski Brod) incidence rate of stroke is higher by 45%, while incidence rate of TIA is higher by 82% than in the coastal part of Croatia, probably due to different lifestyle and environmental factors. The study has shown relatively high incidence rates of acute CVD (stroke and TIA) in the Republic of Croatia, which proves that CVD are a great public health problem.

Key words: *cerebrovascular disorders, stroke, transient ischemic attack, incidence, Croatia*

Introduction

In modern developed countries stroke is the third most common cause of death, after cardiovascular diseases and malignoma. In the Republic of Croatia stroke has been the leading cause of death and invalidity for many years. Thus data analysis on prevalence, incidence and mortality from stroke, as well as the analysis of long-term outcome of this disease, are of great medical and public health significance[1]. The last population indicators on incidence of stroke in the Republic of Croatia were published in the 1980s (Klein-Pudar, Poljaković et al.)[2,3]. As neuroepidemiological data on stroke in our country are outdated and incomplete, new epidemiological studies are necessary[4]. The aim of this study was to establish the real incidence rates of acute cerebrovascular disease (CVD): stroke and transient ischemic attack (TIA) and find out whether there are significant regional differences in the incidence of these diseases in the Republic of Croatia.

Patients and Methods

Four study centres were formed. Two of them were located in the continental part of Croatia (Osijek + Slavonski Brod with surrounding areas and Zagreb with surrounding areas), and another two in the coastal part of

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Fig. 1. Study area and population.

Croatia (Rijeka and Split with their surrounding areas). These centres represent the overall Croatian population well, both geographically and population-related (five largest cities in Croatia). 89 501 examinees were followed for a year (January 1st – December 31st 2005) by their general practitioners who filled-in a default questionnaire for every new case of stroke and TIA. There were 17,210 examinees from the central part of Croatia (Zagreb), 27,471 examinees from the Eastern part of the country (Osijek + Slavonski Brod), 17,755 examinees from the Northern part of Croatian coast (Rijeka) and 27 065 examinees from central coastal part of the country (Split). Geographic distribution of the research centres is shown in Figure 1.

Unfortunately, it was not possible to include the complete population of Croatia, since national stroke registry was not established. Most of the patients with symptoms of stroke and TIA in Croatia are urgently sent to hospitals. Diagnosis is made by a neurologist. This practice was also used in this study. In cases when the affected patients were not sent to a neurologist, diagnosis was made by a family medicine doctor who consulted a neurologist included into this study. The research protocol had several stages. In the beginning, plan of the research was made, diseases were precisely defined and aims were set, population and parameters to be investigated were defined, and questionnaires for investigation were designed. In the next phase, fields of investigation were defined, contacts with general practitioners were made and investigation teams were formed. After that, investigation teams were educated and criteria were standardized. Following the above preparatory actions, we started to collect data and stored them on computer hard disks. In the end we performed statistical analysis. In this research, internationally accepted methodology was applied[5,6]. Internationally suggested criteria for »ideal« stroke incidence study were followed[7] including: standard diagnostic criteria, complete case ascertainment, prospective design, and representative population. All pathological types of stroke were included (CI, PICH, SAH).

The main investigation leader and team leaders in certain regional centers were in continuous contact with general practitioners included in this research. All data were checked by experienced neurologists and then recorded into database. A descriptive statistical analysis has been performed. Incidence rates have been calculated at 100 000 population and the results have been shown in adequate tables.

Results

During one year period (January 1st – December 31st 2005) cases of acute CVD were recorded as follows: 50 cases of stroke and 15 cases of TIA in Zagreb; 83 cases of stroke and 43 cases of TIA in Osijek + Slavonski Brod; 39 cases of stroke and 16 cases of TIA in Rijeka; 53 cases of stroke and 6 cases of TIA in Split (Table 1).

According to data collected on all strokes and TIAs during the investigated period we calculated incidence rates, expressed at the population of 100 000, as follows: Zagreb 290.52, Osijek + Slavonski Brod 302.14, Rijeka 219.65, Split 195.82. Incidence rate of stroke for the Republic of Croatia is 251.39. The following incidence rates of TIA, expressed at the population of 100 000, have been

TABLE 1
NUMBER OF EXAMINEES AND NUMBER OF STROKE AND TIA CASES

Centers	No of patients	No of stroke cases	No of TIA cases
Osijek + Slavonski Brod	27,471	83	43
Zagreb	17,210	50	15
Rijeka	17,755	39	16
Split	27,065	53	16
Total	89,501	225	90

TIA – transient ischemic attack

TABLE 2
THE TOTAL INCIDENCE RATES IN INVESTIGATED REGIONAL CENTERS/100 000 POPULATION

Center	Stroke	TIA
Osijek + Slavonski Brod	302.14	156.53
Zagreb	290.52	87.15
Rijeka	219.65	90.11
Split	195.82	59.10
Average	251.39	100.55

TIA – transient ischemic attack

TABLE 3
COMPARISON OF TOTAL INCIDENCE RATES OF STROKE AND TIA IN CONTINENTAL AND COASTAL PART OF CROATIA

	Stroke		TIA	
Center	No of cases	Incidence rate / 100 000 citizens	No of cases	Incidence rate /100 000 citizens
Continental region (Zagreb, Osijek + Slavonski Brod)	133	297.66	58	129.80
Coastal region (Rijeka, Split)	92	205.26	32	71.40

TIA – transient ischemic attack

established: Zagreb 87.15, Osijek + Slavonski Brod 156.53, Rijeka 90.11, Split 22.16. Incidence rate of TIA for the Republic of Croatia is 100.55 (Table 2).

In the continental part of Croatia (Zagreb, Osijek + Slavonski Brod) incidence rate of stroke is 296.33, while incidence rate of TIA is 121.84. In the coastal part of Croatia (Rijeka, Split) incidence rate of stroke is 207.67, while incidence rate of TIA is 71.40 (Table 3).

In the continental part of Croatia incidence rate of stroke is 45% higher and incidence rate of TIA is 82% higher than in the coastal part of Croatia.

Discussion and Conclusion

Neuroepidemiological studies meet many methodological problems. Community based investigations depend on specific knowledge and readiness of the participants. In spite of the fact that most reliable data on incidence and mortality are those of patients treated in hospitals, even they are not always precise if complete diagnostics and autopsy were not performed. Data obtained from general practitioners and coroners are even less precise. Some cases of stroke are not presented by classic signs of motoric paralysis, speech disorders etc. which causes diagnostic problems. It is even more difficult to diagnose the cause of death in persons who died at home or outside hospitals, due to differentiation of cardiovascular, cerebrovascular or other causes of death. Apoplectic syndrome can appear as a result of other causes like decompensated brain tumors or other acute incidences of central nervous system. In developed countries, epidemiological indicators are well established and well known, while in other regions such data are insufficient. For these reasons no major population studies of stroke epidemiology have been performed in the Republic of Croatia for many years. We

mostly use data of the National Bureau of Statistics on the deceased from this disease in everyday work. The last population study of stroke incidence was performed in 1984 in Zagreb on a small sample of 1 000 inhabitants (Poljaković et al.). The incidence rate of stroke was 2.4‰, and of TIA about 3‰[2]. According to data obtained by this research, the Republic of Croatia is among countries with mild incidence of stroke, like Austria (200-250/100 000) or Germany (170-250/100 000)[8]. Portugal has lower incidence rates for stroke (200/100 000) while higher incidence rates for stroke have been recorded in Auckland-New Zealand (350/100 000), Oxfordshire-Great Britain (379/100 000), Umbria-Italy (374/100 000), Minnesota-USA (362/100 000), Perth-Australia (361/100 000) and Scotland (280/100 000)[9,10]. Extremely high incidence rates have been recorded in some transitional countries like Bulgaria, (909/100 000), Ukraine (238-341/100 000) and Estonia (250/100 000)[11-13]. There are some transitional countries in which low incidence rate for stroke was recorded, like Georgia (165/100 000)[14]. Incidence rate of stroke in the continental part of Croatia is much higher than in the coastal part of Croatia. Causes for such situation are probably different nutritional habits and life conditions. In the coastal part of Croatia fish, fruits, vegetables and olive oil are consumed in considerable amounts, i.e. food with high amount of unsaturated fatty acids and antioxidants. It is well known that such type of nutrition decreases the risk for coronary heart disease and atherosclerosis[15]. Some other factors in life habits and environmental factors are also important. Similar observations and differences between continental and coastal regions in relation to mortality from stroke in the Republic of Croatia have been published[16].

The study showed a relatively high rate of acute CVD (stroke and TIA) incidence in the investigated areas and confirmed CVD as one of the leading medical and public health issues in Croatia. Significantly higher incidence rates of acute CVD in the continental part of Croatia prove that the lifestyle and environmental factors influence the incidence of acute CVD.

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REFERENCES

1. World Health Organization Working Group, J Clin Epidemiol, 41 (1988) 105. — 2. POLJAKOVIĆ Z, KLEIN-PUDAR M, BARAC B, BENČIĆ V, BRINAR V, Incidence of stroke. In: Abstract book of VII Congress of neurologists of Yugoslavia (Herceg Novi, 1984). — 3. KLEIN-PUDAR M, FILIPAN V, POLJAKOVIĆ Z, BENČIĆ V, TOMAŠINEC J, Prevalence of stroke and TIA's. In: Abstract book of VII Congress of neurologists of Yugoslavia (Herceg Novi, 1984). — 4. KADOJIĆ D, Med Vjesn, 33 (2001) 19. — 5. World Health Organization, International classification of diseases, 10. rev. (Medicinska naklada, Zagreb, 1994). — 6. World Health Organization, Research protocol for measuring the prevalence of neurological disorders in developing countries: Neuroscience programme (WHO, Geneva, 1981). — 7. MALMGREN R, WARLOW C, BAMFORD J, SANDERCOCK P, Lancet, 2 (1987) 1196. — 8. BRAININ M, BORSTEIN N, BOYSEN G, DEMARIN V, Eur J Nerol, 7 (2000) 5. DOI: 10.1046/j.1468-1331.2000.007001005.x. — 9. SUDLOW CL, WARLOW CP, Stroke, 28 (1997) 491. DOI: 10.1161/01.STR.28.3.491. — 10. SYME PD, BYRNE AW, CHEN R, DEVENNY R, FORBES JF, Stroke, 36 (2005) 1837. DOI: 10.1161/01.STR.0000177873.82478.1c. — 11. MCNABB SJ, CHUNGONG S, RYAN M, WUHIB T, NSUBUGA P, ALEMU W, CARANDE-KULIS V, RODIER G, BMC Public Health, 2 (2002) 2. DOI:10.1186/1471-2458-2-2. — 12. MIHÁLKA L, SMOLANKA V, BULECZA B, MULESA S, BERECZKI D, Stroke, 32 (2001) 2227. DOI: 10.1161/hs1001.097107. — 13. VIBO R, KÕRV J, ROOSE M, Stroke, 36 (2005) 2544. DOI: 10.1161/01.STR.0000189633.33623.69 — 14. TSISKARIDZE A, DJIBUTI M, VAN MELLE G, LOMIDZE G, APRIDONIDZE S, GAUARASHVILI I, PIECHOWSKI-JÓZWIAK B, SHAKARISHVILI R, BOGOUSSLAVSKY J, Stroke, 35 (2004) 2523. DOI: 10.1161/01.STR.0000144683.96048.98. — 15. World Health Organization, World health statistics annual, 1993 (WHO, Geneva, 1994). — 16. KADOJIĆ D, BABUŠ V, TRKANJEC Z, KADOJIĆ M, MIHALJEVIĆ I, DIKANOVIĆ M, Coll Antropol, 29 (2005) 121.

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INCIDENCIJA MOŽDANOG UDARA I TRANZITORNE ISHEMIJSKE ATAKE U HRVATSKOJ: POPULACIJSKA STUDIJA

SAŽETAK

Cilj ove populacijske neuroepidemiološke studije bio je utvrditi stvarne stope incidencije akutne cerebrovaskularne bolesti (CVB): moždanog udara (MU) i tranzitorne ishemijske atake (TIA) na području Republike Hrvatske (RH).

Multicentričnom studijom obuhvaćena je populacija od 89.501 osoba svih životnih dobi u četiri regionalna središta RH (Zagreb, Osijek + Slavonski Brod, Rijeka i Split). Utvrđene su slijedeće stope incidencije MU izražene na 100.000 stanovnika: Zagreb 290,52, Osijek + Slavonski Brod 302,14, Rijeka 219,65, Split 195,82. Stopa incidencije MU za cijelo područje RH iznosi 251,39. Utvrđene su slijedeće stope incidencije TIA: Zagreb 87,15, Osijek + Slavonski Brod 156,53, Rijeka 90,11, Split 59,10. Stopa incidencije TIA za cijelo područje RH iznosi 100,55. Na kontinentalnom području RH (Zagreb, Osijek + Slavonski Brod) stopa incidencije MU veća je za 45%, a stopa incidencije TIA veća je za 82% u odnosu na priobalni dio RH, vjerojatno zbog razlika u načinu života i okolišnih čimbenika. Studijom su utvrđene relativno visoke stope incidencije akutne CVB (MU i TIA) u RH što potvrđuje da su cerebrovaskularne bolesti veliki javnozdravstveni problem.