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The Last Three Decades of Stroke Epidemiology in Novi Sad

By Milorad Žikić
Novi Sad University

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Ten years were successful at completing of their mission. In the period 1983 – 1992 morbidity and mortality from stroke dropped by about 20%. The main activities dealt with recording the incidence and mortality of stroke and analysis of population samples during intervention program. The results of Stroke epidemiology since 1993 and later show that with the war in the neighboring countries decrease of general life standard of population. Large social, medical and economic sanctions imposed by United Nations, the previous favorable results, this beneficial trend have reversed and rates have increased continually. All results are undergoing the final analyses and tests of hypotheses, and they are published in the most reputable world medical journals. Unfortunately, the main risk factors in population age 20 years and over in the first decade of XXI century in Autonomic Province of Vojvodina are still physical inactivity, hypertension, smoking, overweight, and obesity, the same that were at the beginning of the WHO MONICA program, at the end of XX century in Novi Sad.

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I. Introduction

Episodes of stroke and familial stroke occurrence have been reported as early as 2700 years ago in ancient Mesopotamia and Persia (1). During this very long history stroke events and today represent one of the main cause of disabilities and deaths over the world. Changing concepts of the etiology, diagnosis, and treatment of stroke syndromes in the past more than 60 years have been responsible for a widespread renewal of interest in this disease, and we have identified major risk factors (RF) for the disease and have developed stroke management from the primary prevention to the treatment in the acute phase, secundary prevention and medical rehabilitation of stroke (2).

The MONICA (Multinational MONItoring of trends and determinants in CArdiovascular disease) Project was established in the early 1980s by the World Health Organization (WHO) Working Group in many centers around the world. It was set up to explain the diverse trends in cardio and cerebrovascular disease (CVD) mortality which were observed from the 1970s onwards. Specifically the programmed focuses on trends in event rates for validated fatal and non-fatal coronary heart attacks and strokes, and on trends in CVD and stroke risk factors (blood pressure, cigarette smoking and serum cholesterol) in men and women aged 25-64 in the same defined communities. By this means it is hoped both to measure changes in CVD and stroke mortality and to see how far they are explained; on the one hand by changes in incidence mediated by risk factor levels; and on the other by changes in case-fatality rates, related to medical care. Population centers need to be large and numerous; to reliably establish 10-year trends in event rates within a centre 200 or more fatal events in men per year are needed, while for the collaborative study a multiplicity of internally homogeneous centers showing differing trends will provide the best test of the hypotheses. At the beginning were 41 MONICA Collaborating Centers, using a standardized protocol, are studying 118 Reporting Units (subpopulations) with a total population aged 25-64 (both sexes) of about 15 million. Finally, there were total of 32 MONICA Collaborating Centers in 21 countries which successful finish all of anticipated investigation. The total population age 25-64 years monitored was ten million men and women. The ten year data collection was completed in the late 1990s, and the main reswere published in the following years. The data are still being used for analysis (3, 4).

II. The Who Monica CollaBorating Center in Novi Sad (Mcc ns) (Yugnos 49)

MCC NS was one of the participants in WHO MONICA Project, and was the only MONICA population in former Yugoslavia. Citizens aged 25-64 of the city of Novi Sad, a multiethnic and multicultural society of some 20 nationalities. There were several hospitals, a medical centre and a university medical school. Mortality from stroke was the highest in the country. Response to population surveys was very good. Health service of Novi Sad successfully passed the strict criteria, and was highly estimated for its research. The first MONICA survey determined the levels and distribution of major RF, contributing to preventive work on coronary disease and stroke (6).

Author : MD, PhD , Professor of Neurology in retire, School of Medicine Novi Sad University, AAN Senior Member.
E-mail : milorad.zikic@gmail.com

Following the 1982 WHO report on the regional differences in standardized stroke mortality rates in Socialistic Federal Republic (SFR) Yugoslavia which was unfavorable for the population in Autonomic Province of Vojvodina, Novi Sad, and the Health Service started doing research within the MONICA Project. The study was instigated in 1983 and was supposed to last 10 years. During the conduction of the study our country fell apart, due to participation in war operations in surrounding countries, it was isolated from the international community and it suffered UN sanctions. Because of this Novi Sad MONICA center extended its work after the study has reached its end and Project lasted until 2005. Novi Sad MCC was a unique link between our country and international communities during the isolation and sanction period from 1992 to 1996 and from 1998 to 2001 (5, 6).

Aim of the study was to measure the trends of the stroke morbidity and mortality, as well as the evaluation of their connection with the changes in main RF, life styles, development of the health service and socio economic characteristics measured simultaneously in defined populations (6).

Data was gathered on ischemic stroke for the population of 25- 64 years of age, also collected was data on the presence of RF obtained from the examination of the population representative sample 1984, 1988 and 1994 (Table1, 2 and 3) (5, 6).

Table 1 : Distribution of risk factors for the sample of Novi Sad inhabitants 1984

MONICA 1984	N	%
HYPERTENSION (21.3/12/7 kpa plus)	408	25.80
HYPERCHOLESTEROLEMIA(6.7mmol/lplus)	214	13.50
HYPERGLYCEMIA (5.6 mmol/l plus)	53	5.10
SMOKING (5 cigarettes plus)	625	39.50
OBESITY (27.0 plus)	688	43.50
DAILY DRINKING	137	8.60

Table 2 : Distribution of risk factors for the sample of Novi Sad inhabitants 1988

MONICA 1988	N	%	MEAN	VAR	CD	CV
HYPERTENSION (N=1556)	422	27.00	17.97	6.72	2.60	14.46
HYPERCHOLESTEROL (N=1556)	614	39.13	6.20	1.68	1.30	20.94
HYPERGLYCEMIA (N=1270)	324	20.65	5.17	2.62	1.63	31.52
SMOKING (N=1556)	654	41.70	20.43	132.70	11.53	56.42
OBESITY (N=1556)	698	44.50	26.76	20.20	4.50	16.81

Table 3 : Distribution of risk factors for the sample of Novi Sad inhabitants 1994

MONICA 1994	N	%	MEAN	VAR	CD	CV
HYPERTENSION (N=1554)	519	33.40	17.89	8.98	3.00	16.75
HYPERCHOLESTEROL (N=1270)	461	36.30	6.12	1.69	1.30	21.25
HYPERGLYCEMIA (N=1270)	342	26.93	5.54	4.71	2.18	39.33
SMOKING (N=1554)	655	42.14	21.48	88.72	9.42	17.88
OBESITY (N=1270)	586	46.14	26.94	23.18	4.82	16.81
DAILY DRINKING(N=1554)	204	13.13	-	-	-	-

After the diagnostic categorization was performed using an algorithm in accordance to MONICA protocol, event registration was done (Table 4 and 5) (6).

During the period from 1983 to 2005 in general population were registered 10.874 stroke events: male 52% and female 48%. Mortality rate during 28 days was 53, 3%. At the end of the first ten years incidence rate decrease to 15, 3 %, and at the end of the study it's increase for 53%. Mortality rates at the first period decreased to 48%, and at the end of the study increase for 21 % (Table 4).

Table 4

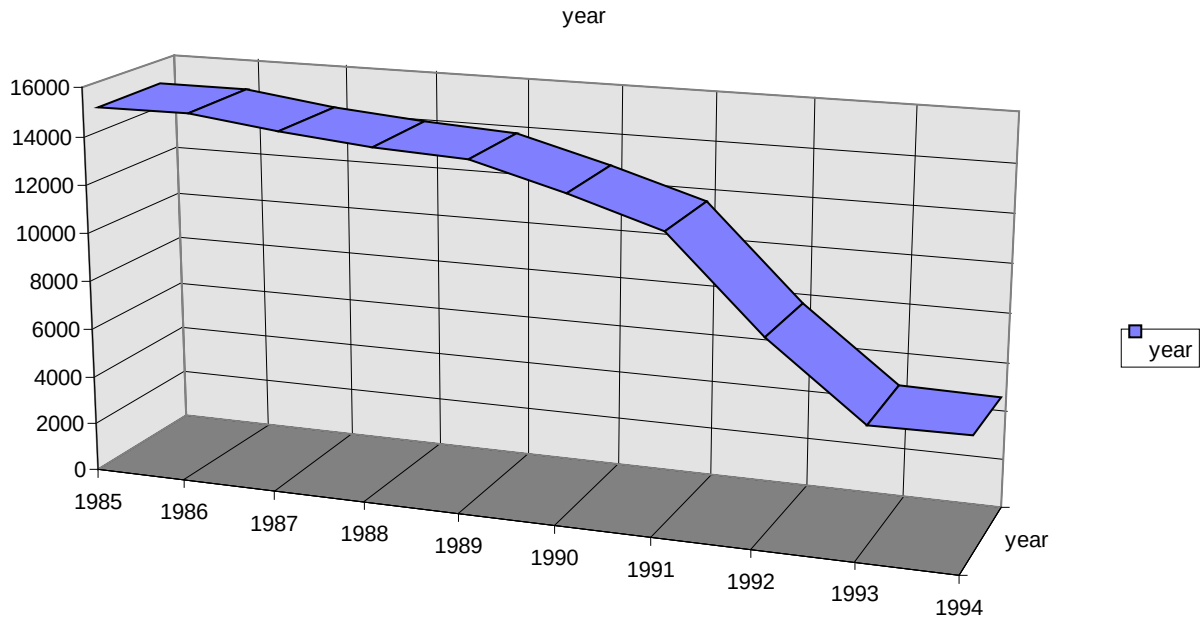
R.B.	GODINA	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2003	2004	2005	SVEGA
1	Dk=1 nefatalno	191	203	186	254	241	202	257	235	217	200	219	252	302	320	313	309	213	295	343	317	5,069
2	Dk=4 nefatalno	0	0	0	0	0	0	0	6	0	0	0	0	0	0	1	0	0	1	1	0	9
3	Dk=5 nefatalno	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	2	7
4	Dk=9 nefatalno	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	6	0	0	0	10
1-4	NEFATALNO	191	203	186	254	241	202	257	241	217	200	219	252	302	320	315	313	219	297	347	319	5,095
5	Dk=1 fatalno	269	289	263	226	268	239	216	170	229	219	275	300	323	348	346	376	263	355	322	366	5,662
6	Dk=4 fatalno	5	10	4	1	5	4	5	11	6	7	5	0	4	3	9	2	0	1	1	0	83
7	Dk=5 fatalno	3	1	0	1	4	1	3	1	2	1	1	1	4	3	2	1	0	3	5	4	41
8	Dk=9 fatalno	51	16	0	4	1	1	2	2	0	1	1	1	0	0	2	2	1	0	0	0	85
5-8	FATALNO	328	316	267	232	278	245	226	184	237	228	282	302	331	354	359	381	264	359	328	370	5,871
1-8	SVEGA	519	519	453	486	519	447	483	425	454	428	501	554	633	674	674	694	483	656	675	689	10,966
Dk1NF+Dk1F+Dk5F +Dk9F		514	509	449	485	514	443	478	408	448	421	496	554	629	671	663	688	477	653	670	687	10,857
SVEGA (bez Dk4NF i DK4F)		514	509	449	485	514	443	478	408	448	421	496	554	629	671	664	692	483	654	673	689	10,874
DK1F,DK5F,DK9F		323	306	263	231	273	241	221	173	231	221	277	302	327	351	350	379	264	358	327	370	5788
DK1F,DK5F,DK9F/ DK1NF,DK1F,DK5F, DK9F		62.8%	60.1%	58.6%	47.6%	53.1%	54.4%	46.2%	42.4%	51.6%	52.5%	55.8%	54.5%	52.0%	52.3%	52.8%	55.1%	55.3%	54.8%	48.8%	53.9%	53.3%

In MONICA population registered were 3324 stroke events: 30, 6 % from all of stroke events in general populations. At the end of the study the incidence rate was for 10 % higher. Mortality rate at the first ten years was decrease for 20 %. At the end of the study mortality rate for 33, 5% increase (Table 5).

Table 5

R.B.	GODINA	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2003	2004	2005	SVEGA
1	Dk=1 nefatalno	89	112	112	142	128	110	132	110	112	106	121	107	149	138	124	138	77	136	120	132	2,395
2	Dk=4 nefatalno	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	4
3	Dk=5 nefatalno	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
4	Dk=9 nefatalno	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	5
1-4	NEFATALNO	89	112	112	142	128	110	132	113	112	106	121	107	149	138	124	139	81	137	121	133	2,406
5	Dk=1 fatalno	66	54	81	58	72	95	92	57	74	69	72	90	94	81	97	85	48	77	132	129	1,623
6	Dk=4 fatalno	5	10	4	1	3	1	.5	6	3	3	1	0	1	2	5	0	0	0	2	0	52
7	Dk=5 fatalno	3	1	0	1	1	1	2	1	0	0	0	1	3	1	0	1	0	3	0	1	20
8	Dk=9 fatalno	4	0	0	1	0	0	1	0	0	0	1	1	0	0	1	2	0	0	0	0	11
5-8	FATALNO	78	65	85	61	76	97	100	64	77	72	74	92	98	84	103	88	48	80	134	130	1,706
1-8	SVEGA	167	177	197	203	204	207	232	177	189	178	195	199	247	222	227	227	129	217	255	263	4,112
Dk1NF+Dk1F+Dk5F +Dk9F		162	167	193	202	201	206	227	168	186	175	194	199	246	220	222	226	125	216	252	262	3,319
SVEGA(bez Dk4NF i DK4F)		162	167	193	202	201	206	227	168	186	175	194	199	246	220	222	227	129	217	252	263	3,324
DK1F,DK5F,DK9F		73	55	81	60	73	96	95	58	74	69	73	92	97	82	98	88	48	80	132	130	1654
DK1F,DK5F,DK9F/ DK1NF,DK1F,DK5F, DK9F		45.1%	32.9%	42.0%	29.7%	36.3%	46.6%	41.9%	34.5%	39.8%	39.4%	37.6%	46.2%	39.4%	37.3%	44.1%	38.9%	38.4%	37.0%	52.4%	49.6%	49.8%

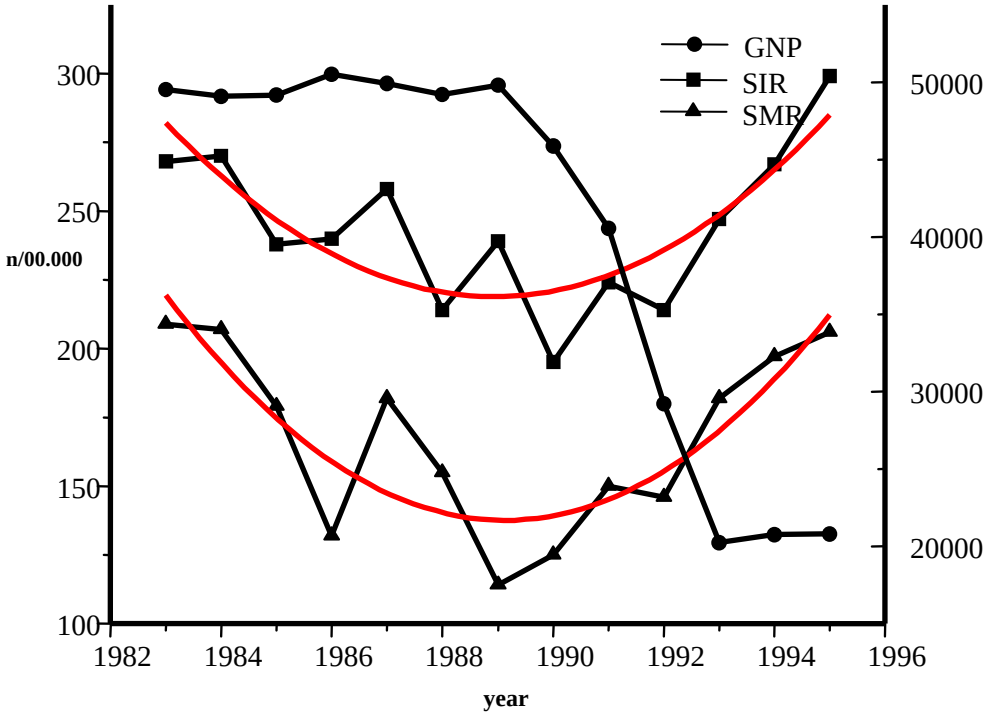
Figure 1 : Gross National Product (GNP) in Autonomic Province of Vojvodina from 1985 to 1994 (in YUD milliard)



After destroyed of former SFRY, from 1992 to 1995 in the new sociopolitical community named Socialistic Republic of Yugoslavia (SRY) established the higher economic crisis and monetary inflations in modern human history, because introducing of the UN sanctions in all part of life and work.

Considering the significant differences in the movement of incidence and lethality in the study period from 1983-1992 and after that up to 2005, the results were separately analyzed. In the first period incidence was 12% lower and the mortality rate 21% lower on the annual level. During the duration of the UN sanctions (1992-1995) ischemic stroke incidence was increased 26,6%, and lethality 2,7%, and at the end of the second period the incidence was higher for 30% and lethality for 33,5%.

Figure 2 : Relation between Gross National Product (GNP), incidence (SIR) and mortalit (SMR) stroke rates from 1983 to 1995



In the period 1983 – 1990 morbidity and mortality from stroke fell by about 20%. Since 1991, and especially from 1992, with war circumstances and economic sanctions, this beneficial trend has reversed and rates have increased continually (6). The circumstances in which the prophylactic project for ischemic stroke is conducted directly proportionately affect the results gained.

The research results of MCC NS are undergoing the final analyses and tests of hypotheses, and they are published in the most reputable world journals (7). The main activities dealt with recording the incidence of stroke, analysis of population samples and carrying out intervention program. During favorable social, political and economic circumstances, the results of decreased of the incidence and mortality from stroke indicate that take of prophylactic measures at the first period 1983 - 1992 were successful completion of a mission (8, 9, 10).

Methodological questions connected with choosing and applying a sampling method for monitoring CVD in multinational, multicentric WHO MONICA project, the sample which was used for periodical assessment of changes in RF levels were very carefully collected and finally analyzed, and mandatory data collection about the RF's in the city area of Novi Sad, transferred to Data Centre in Helsinki, became a part of an international open-source database (11).

Despite this, the main RF in population aged 20 years and over still in 2006 in Autonomic Province of Vojvodina are physical inactivity (65,4 %), hypertension (46,1 %), smoking (37,5 %), overweight (35,2 %), and obese (20,5 %). About 7 % of adults who drink alcohol are in the group with moderate risk for development of chronic disease, while 3,7 % are heavy drinkers. Such situation requires integrated strategic approach supported with policy, capacity building, surveillance and dissemination (12).

III. Conclusion

During favorable circumstances, the results of decreased of the incidence and mortality from coronary and cerebrovascular disease, indicate that take of prophylactic measures during the first ten years period were successful completion of a mission. (9, 10)

Multicentric, multinational and scientific research WHO MONICA Project, apart from having large scope and large statistical background, also has a great scientific influence measured by about 6000 citation at the base of Web of Science Citations Index (13).

Without prophylactic measurements it is not possible to give favorable results in this very complex health fields, and actually the main risk factors in population age 20 and over, still in 2006 in Autonomic Province of Vojvodina, are the same as they were at the beginning of the WHO MONICA project before 25 years. Such situation requires integrated strategic approach supported with policy, capacity building, surveillance and dissemination (12).

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