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O.O. Filipets,

V.M. Pashkovsky

Bukovinian State Medical University, Chernivtsy

STROKE BURDEN IN UKRAINE: ANALYSIS OF THE OFFICIAL STROKE STATISTICS AND   OVERVIEW OF POPULATION-BASED EPIDEMIOLOGICAL STUDIES

Key words: stroke, epidemiology, incidence, registry.

Abstract
Analysis of the official statistical reports has shown an increase in stroke incidence rate in Ukrainian population, considerable diversities in stroke occurrence and dissimilar trends of incidence in different geographical areas for the last 19 years. High-quality, population-based stroke epidemiology studies are necessary to provide a reliable data on key indicators of stroke burden. The establishment of effective stroke observation system in Ukraine will allow prevention strategies planning, decreasing stroke incidence and improving stroke management.

Introduction

Cerebral stroke has been recognized as an important cause of morbidity, death and long-term disability [10]. The results of epidemiological studies show that the global incidence of stroke ranges from 75 to 450 per 100 000 of population [5]. According to the World Health Organization (WHO), about 15 million people suffer from stroke each year; more than 1.2 million of these cases are registered in Europe. The greatest is the burden of stroke in the low-income and middle-income countries where 69% of all incident stroke cases which accounted for 78% of total losses of disability-adjusted life years were registered in 2010 [4]. WHO estimates that more than 5 million people are dying from stroke every year, in this way strokes cause 9-12% of all deaths in the community. Over two thirds of these deaths occur in people living in less developed countries [4].

Among all the European countries the highest stroke morbidity and mortality rates are reported from eastern European countries [13, 19]. High occurrence of stroke in these countries is primarily related to substantial social and economic changes in the last decades, including inadequate restructuring of the healthcare system [1]. This resulted in considerable decrease of the level of primary prevention and it has lead to higher prevalence and poor control of common cardiovascular risk factors among population. Besides most of European countries have rapidly ageing populations that has lead to increase in the midle age and growth of stroke burden.

Numerous epidemiological studies have demonstrated continuous downward trend in stroke incidence and substantial decline of stroke mortality rates in many developed countries over recent decades [18, 21]. The decrease of stroke incidence is believed to be a result of better control of hypertension and other modifiable risk factors in the population combined with a parallel improvement in living standards. At the same time decrease of mortality indicates improvement of stroke management and care [14]. During the same period in many Eastern European countries the total number of strokes and stroke deaths remains high stable or constantly increasing [4].

Cerebral stroke is one of the most actual medical problems in Ukraine that has high public health relevance. According to official annual reports of Ministry of Health, approximately 100-120 000 Ukrainians have a new or recurrent stroke each year. Stroke epidemiology in different parts of Ukraine traditionally shows different patterns, including the lowest stroke incidence rates in western regions and the highest in eastern and southern regions. Respectively in 2013 the annual stroke attack rates in different regions varied considerably from 202 to 393 per 100 000. Moreover Ukraine has some of the highest stroke mortality rates in Europe which also showed large geographical variations from 33.2 to 144.6 per 100 000 in 2013.

Stroke burden in the population can be measured by the basic epidemiological characteristics such as incidence and mortality. Data on stroke occurrence are essential for improved planning of stroke prevention and management [12]. The existing routine system of registration of stroke cases is an important tool for monitoring the disease but the optimal method to get accurate epidemiological data is a prospective population based study - stroke registry. The international experience on stroke observation gives evidence that stroke registry is the only possible source of reliable information on key indicators of stroke

burden and is considered an effective tool to identify prevention priorities [2, 8, 9, 15].

The aim of the present research is to examine the trends in levels of stroke incidence for Ukrainian population as a whole and in selected subpopulations. A secondary purpose is to summarize the available studies on stroke epidemiology in Ukraine and to identify strengths and weaknesses of presently available data and studies. The third purpose is to determine the current needs for improving stroke prevention and management.

Methods

We have retrospectively analyzed the official data on stroke incidence in Ukraine over a 19-year period from 1995 to 2013 according to annual statistical reports published by Ministry of Health of Ukraine. We have also performed the literature search for the prospective population-based stroke studies (registries) that were set in Ukraine in different years with the further analysis of the basic characteristics of stroke epidemiology and care.

Results

The data on crude stroke incidence for Ukrainian population based on official reports are showed in Figure 1.

According to the presented values stroke incidence rates in the Ukrainian population have generally increased by 43.3% from 1995 to 2013. A continuous upward trend from 1995 to 1999 has changed to gradual decline of stroke rates which lasted till 2004. From 2004 on there is a constant increase in stroke incidence rate which has reached the highest for the last 19 years value in 2013 - 299.5 per 100 000.

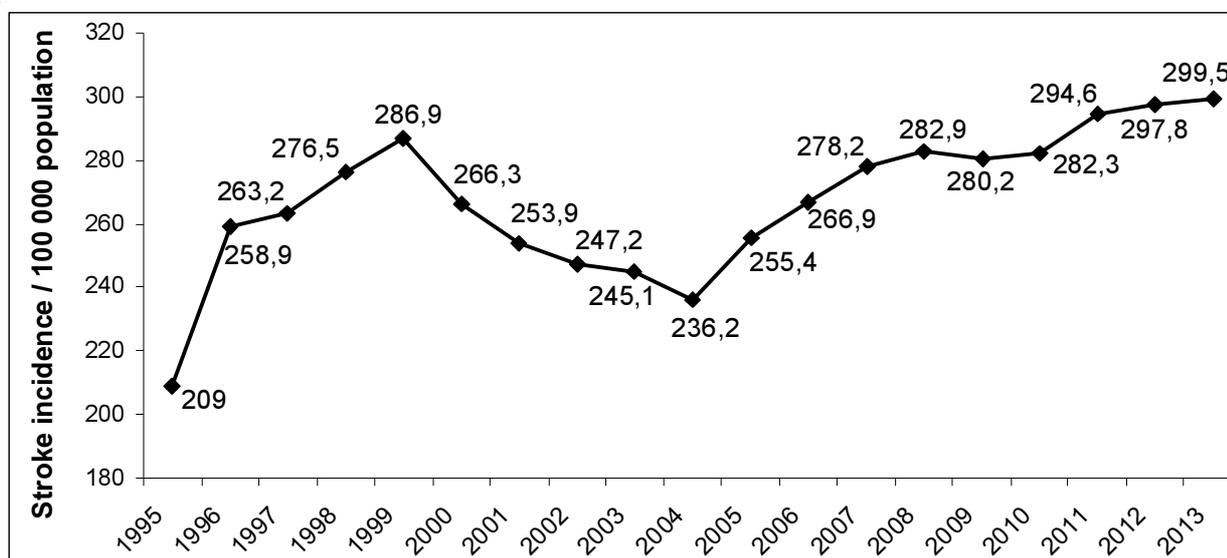Taking into consideration significant territorial

Figure 1. Stroke incidence rates in Ukraine per 100 000 population in 1995-2013

disparities we assessed the available epidemiological data (from 1999 to 2003) from 25 regions of Ukraine. We have found that the differences in stroke incidence between the regions with the lowest and highest rates are 3-fold. For the further analysis we have selected the regions with the highest and lowest stroke incidence at baseline. In 1999 the highest was the rate in easternmost region of Luhansk bordering Russian Federation - 495.4 per 100 000. The lowest rate was registered in western region of Lviv bordering Poland - 124.3 per 100 000.

The analysis of epidemiological data from two different geographical areas has shown a striking 4-fold difference in stroke occurrence in 1999 and divergent trends in incidence (Figure 2).

Stroke incidence in Luhansk showed sizable reduction by 27.6% from 1999 to 2001 and relatively stable levels of attack rates from 2001 to 2013 with the minimal rate of 329.4 per 100 000 in 2004 and

maximal rate of 376.2 per 100 000 in 2010. The total decline of stroke incidence in Luhansk from 1999 to 2013 comprised 24.4%. Due to the lack of appropriate studies we are unable to identify precisely the causes for these declines.

In contrast, stroke rates have generally increased by 62.5% in Lviv from 124.3 per 100 000 in 1999 to 202.0 per 100 000 in 2013. The incidence levels showed almost continuous upward trend but still the highest incidence in Lviv of 203.1 per 100 000 in 2011 was 1.6-fold lower than the lowest incidence in Luhansk during the study period.

This study supports accumulating evidence of heterogeneity in stroke epidemiology in different populations and geographic areas. Previous studies suggest that the reasons for territorial diversity may be socio-economic differences including urban or rural residence, environmental conditions, occupation (eastern regions of Ukraine are predominantly
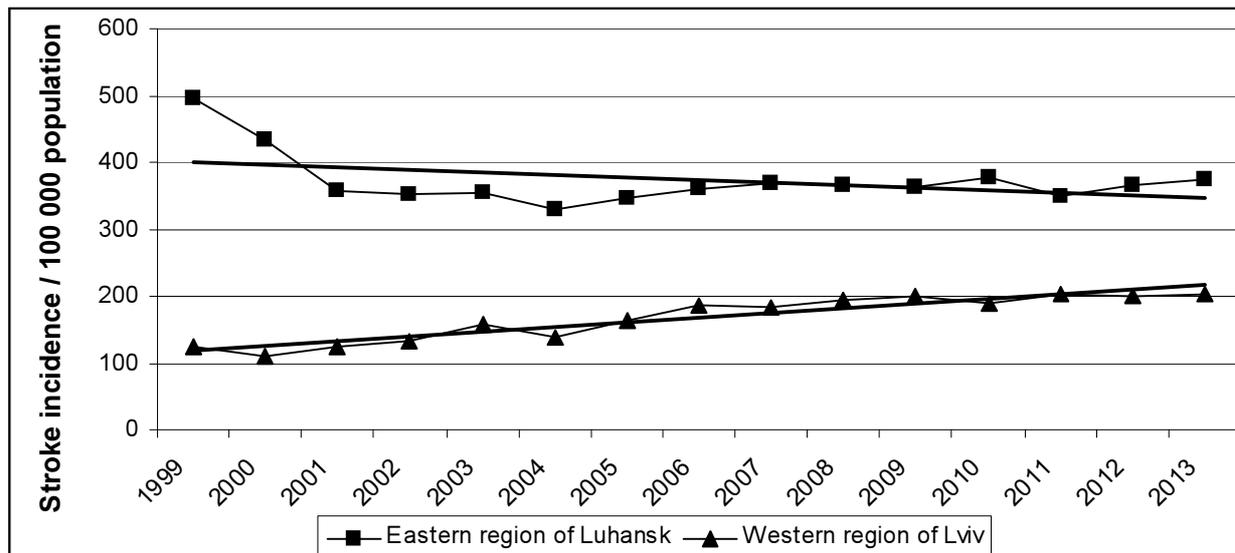
Figure 2. Stroke incidence rates in Ukrainian easternmost region of Luhansk and western region of Lviv per 100 000 population in 1999-2013. Solid line is a linear regression line.

industrial, while western regions are agricultural areas), lifestyle, prevalence of risk factors, access to medical control, income that varies among regions etc., otherwise they may be attributed to methodological issues [19].

The evidence from the population-based studies shows that routine incidence and mortality data are not ideal for epidemiological calculations. As a rule the basic epidemiological data in daily practice are determined according to patients' referrals to public healthcare institutions therefore they do not reflect real stroke incidence and mortality rates. Therefore these estimates may be used for assessment of stroke burden only if no other information is available. The optimal method to study stroke epidemiology is to establish community-based stroke studies in as many regions as possible [20].

We have reviewed all population-based stroke studies that were set in Ukraine with no restriction on study date. Information on stroke registries was available from four regions: Uzhgorod, [16], Sumy [11], Kharkiv [17] and Chernivtsi [7]. All these studies had prospective design and used standardized criteria of stroke case ascertainment and verification, and multiple overlapping methods of case registration. In all registries case ascertainment was restricted to urban areas. The previous studies have shown that stroke occurrence is likely to be higher in urban populations than in rural areas. The key data from the registries are summarized in Table 1.

Two out of four studies did not meet the criteria for an "ideal" stroke study [3] as all stroke events that occurred in the community during the study period (inclusive recurrent strokes) were included in analysis. And according to the requirements for epidemiological survey of stroke only incident strokes should be considered for assessment. The

available data of Sumy and Kharkiv registries provided only crude stroke incidence and mortality rates that precluded national and international comparisons. Nevertheless, all the studies provided information on age and gender structure of incidence, mortality and early case fatality, as well as prior-to-stroke risk factors. The investigators presented also stroke subtype-specific analyses with epidemiological characteristics of four main stroke types: ischaemic stroke, primary intracerebral haemorrhage, subarachnoid haemorrhage and undefined. But this information can hardly be reliable because of low proportion of diagnostic verification with CT and MRI. For example according to the most recent results of Chernivtsi registry only 30.6% of persons diagnosed with stroke underwent cerebral imaging [6] and for a reliable stroke databank a high (70-80%) neuroimaging investigation rate is required [3]. Patients who fulfill the WHO criteria for stroke but whom neither a CT, MRI, nor an autopsy (or cerebral angiography or CSF examination for patients with suspected subarachnoid haemorrhage) was done should be classified as having undefined stroke [5].

Thus, since the first epidemiological study was set in 1999 only 4.4% of Ukraine's population has been covered by stroke registries in different years. Some of them failed to submit internationally comparable data that is valuable for identifying high-risk populations and planning preventive interventions. Long-term trends in stroke incidence in different populations have not been characterized. But despite their shortcomings, the community-based registries provided far more information about stroke burden than any official statistical report.

The results of our study have shown the inc-

Table 1

The review of population-based stroke registries in Ukraine

	Uzhgorod, Western Ukraine	Sumy, Northern Ukraine	Kharkiv, Eastern Ukraine	Chernivtsi, Western Ukraine
Study population	125 482	291 963	1 470 902	240 476
Study period	1-Oct-1999 – 30-Sep-2000	1-Jan-2001 – 31-Dec-2002	1-Jan-2002 – 31-Dec-2003	1-Jan-2006 – 31-Dec-2007
Number of registered cases of acute stroke				
- all strokes	352	1293	7614	1363
- first-ever strokes	n/a	n/a	n/a	1080
Mean age of stroke patients, y	63.4	64.5	64.9	66.7
Stroke incidence, per 100 000		Mean for 2 years	Mean for 2 years	Mean for 2 years
- crude	280	222*	244*	224
- European Standard	341	n/a	n/a	229
- World Standard	238	n/a	n/a	176
Stroke mortality, per 100 000				
- crude	65	64*	87*	61
- European Standard	83	n/a	n/a	62
- World Standard	69	n/a	n/a	47
30 days stroke case fatality	23.3%	29%	34%	27.4%
% of hospital admission	66.5%	68.5%	57%	84%

*Stroke incidence and mortality data including first-ever and recurrent strokes

reasing burden of cerebral stroke in Ukraine and the further perspective is unpromising due to various reasons. First, the data from The State Statistics Service of Ukraine shows that Ukraine has a declining population which has fallen from 51.8 million in 1990 to 45.4 million in 2013 mainly because of low fertility rates. The demographic transition of the past decades has resulted in the aging trend with increase of the number of the elderly in the total population. The proportion of people age 65 and older grew from 11.9% in 1990 to 15.2% in 2013. That is expected to further increase the incidence of the ageing-related diseases including stroke. Second, insufficient resources and capacity of health system, inconsistent preventive strategies and exposure to major risk factors contribute to the population burden of stroke.

Because of lacking epidemiological data it is important to perform epidemiological investigations in Ukraine. They have to fulfill the criteria of the gold standard which are as follows: complete, population based case ascertainment based on multiple overlapping sources of information (hospitals, outpatient clinics, emergency service, autopsy protocols, and department of statistics which keeps records of all death in the region); standard WHO definition of stroke; incident stroke cases reported; data collection over whole years; no upper age limit for the popu-

lation studied; and a prospective study design [3].

Prospective epidemiological studies will have direct practical use: the data arising from the study might help health care authorities in the region to define the most important measures for primary prevention and to provide information needed to organize a more efficient health care system for stroke patients. Monitoring of the trends in epidemiological characteristics of stroke in the same populations, together with measurement of the impact of stroke risk factors, would help to find the best strategies for decreasing of stroke incidence and mortality.

Conclusions

1. Analysis of the official statistical reports has shown a 43.3% increase of stroke incidence rate in Ukrainian population in the last 19 years. We have found considerable diversities in stroke occurrence and dissimilar trends in incidence in different geographical areas.

2. There is a limited number of high-quality, population-based stroke epidemiology studies in Ukraine. More studies are needed to provide a reliable data on key indicators of stroke burden such as incidence and mortality.

3. The present study adds to the evidence that

effective stroke surveillance system needs to be established in Ukraine. It will allow for planning prevention strategies, decreasing stroke incidence and improving stroke management.

Perspectives of the future research

The further research should focus on monitoring the main epidemiological characteristics of stroke in parallel with assessment of changes in prevalence of stroke risk factors among population for the further development of effective preventive strategies.

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МОЗКОВИЙ ІНСУЛЬТ В УКРАЇНІ: АНАЛІЗ ОФІЦІЙНИХ СТАТИСТИЧНИХ ДАНИХ ТА ОГЛЯД ПОПУЛЯЦІЙНИХ ЕПІДЕМІОЛОГІЧНИХ ДОСЛІДЖЕНЬ

О.О. Філіпець, В.М. Пашковський

Резюме. Проведено ретроспективний аналіз офіційних статистичних даних щодо захворюваності на інсульт в Україні з 1995 по 2013 роки, а також літературний пошук результатів проспективних популяційних реєстрів інсульту, проведених в Україні у різні роки. Встановлено, що рівень захворюваності на інсульт за досліджуваний період зріс на 43,3%, досягнувши найвищого за останні 19 років показника у 2013 році - 299,5 на 100 тисяч населення. Порівняння епідеміологічних показників із різних регіонів України виявило значні територіальні відмінності та різноспрямовані тенденції до зміни захворюваності. Аналіз існуючих епідеміологічних досліджень показав, що популяційними реєстрами охоплено лише 4,4% населення країни, що перешкоджає плануванню профілактичних стратегій та організації ефективної системи медичної допомоги хворим на інсульт. Подальші зусилля повинні бути спрямовані на створення системи моніторингу епідеміологічних характеристик та чинників ризику мозкового інсульту, що необхідно для впровадження науково обґрунтованих заходів для зниження захворюваності та смертності від гострих порушень мозкового кровообігу.

Ключові слова: мозковий інсульт, епідеміологія, захворюваність, реєстр.

МОЗГОВОЙ ИНСУЛЬТ В УКРАИНЕ: АНАЛИЗ ОФИЦИАЛЬНЫХ СТАТИСТИЧЕСКИХ ДАННЫХ И ОБЗОР ПОПУЛЯЦИОННЫХ ЭПИДЕМИОЛОГИЧЕСКИХ ИССЛЕДОВАНИЙ

Е.А. Филипец, В.М. Пашковский

Резюме. Проведен ретроспективный анализ официальных статистических данных о заболеваемости инсультом в Украине с 1995 по 2013 годы, а также литературный поиск результатов проспективных популяционных регистров инсульта, проведенных в Украине в разное время. Установлено, что уровень заболеваемости инсультом за период исследования вырос на 43,3%, достигнув наивысшего за последние 19 лет показателя в 2013 году - 299,5 на 100 тысяч населения. Сравнение эпидемиологических показателей из разных регионов Украины выявило значительные территориальные различия и разнонаправленные тенденции к изменению заболеваемости. Анализ существующих эпидемиологических исследований показал, что популяционными регистрами охвачено только 4,4% населения страны, что препятствует планированию профилактических стратегий и организации эффективной системы медицинской помощи больным инсультом. Дальнейшие усилия должны быть направлены на создание системы мониторинга эпидемиологических характеристик и факторов риска мозгового инсульта, что необходимо для внедрения научно обоснованных мероприятий для снижения заболеваемости и смертности от острых нарушений мозгового кровообращения.

Ключевые слова: мозговой инсульт, эпидемиология, заболеваемость, регистр.