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Temporal trends in vascular risk factors and etiology of urban Polish stroke patients from 1995 to 2013

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ABSTRACT

Background: Despite estimates about general trends in stroke epidemiology worldwide, there are only a few reports of detailed longitudinal data and none of them reflects the economic transition that occurred in Central and Eastern Europe over the last two decades. The aim of this study was to investigate long term trends in risk factors and their pre-stroke control as well as acute stroke clinical presentation and etiology in Polish urban setting.
Methods: This is a retrospective registry-based analysis of consecutive acute stroke patients from a highly urbanized area (Warsaw, Poland) admitted to a single stroke center between 1995 and 2013. Patients were divided into four time periods: 1995–1999 (n = 529), 2000–2004 (n = 1253), 2005–2009 (n = 1320) and 2010–2013 (n = 871).
Results: During the study period 3973 first-ever stroke patients were admitted. The proportion of ischaemic strokes (88.2% to 90.9%) and male patients (45.2% to 46.2%) remained stable throughout the whole study period. Admitted patients became older (72, 73, 74 and 76 years, consecutive time periods), were more likely to be diagnosed with hypertension (from 61.1% to 72.8%) and disable (84.3% to 67.4%) prior to stroke. There was an increase in pre-stroke use of antihypertensives in patients with hypertension (from 77.8% to 90.5%), antiplatelets in patients with coronary artery disease (from 33.9% to 56.5%), vitamin K antagonists in patients with atrial fibrillation (from 6.3% to 39.8%) and statins (from 7.6% to 26.3%). There was a decrease in mean stroke severity (9, 11, 8 and 6 points on the National Institutes of Stroke Scale) on admission and the proportion of strokes attributed to small-vessel disease (22.0%, 20.0%, 10.6% and 8.3%).
Conclusions: Over the last two decades the profile of urban Polish stroke patients has changed significantly and it can be attributed to marked economic improvement in Poland since 1990s. Increasing age and better management of pre-existing vascular risk factors were accompanied by decreasing stroke severity and lower proportion of strokes attributed to small-vessel disease.

1. Introduction

Stroke is one of the main causes of mortality in adults and is the leading cause of disability. The absolute number of new cases has increased worldwide between 1990 and 2010 for both ischemic stroke (by 37%) and intracerebral hemorrhage (by 47%) [28]. However, stroke incidence varies between regions. In that time period the 13% reduction of incidence in high-income countries [28] has been balanced by 12% increase in low-income and middle-income countries [15]. Therefore, continuous optimization of primary prevention, stroke care and long term rehabilitation is necessary.

Estimates from the Global Burden of Disease Study give invaluable insight into general trends in stroke epidemiology worldwide [15]. However, they need to be complemented with more detailed studies conducted on locally defined populations based on longitudinal data. Tracking changes in the profile of a typical patient provides indirect information about the impact of contemporary strategies for diagnosing and controlling vascular risk factors. It also allows us to better understand the current situation of stroke care and identify most vulnerable areas for future health policies.

There are some reports of longitudinal data from Western Europe [2,20,31,41]. However, there are no studies of Central and Eastern Europe populations where benefits from increasing medical expertise knowledge and availability of novel diagnostic and therapeutic methods might have been accelerated by substantial economic development. Poland, among several other Central and Eastern European countries, was until early 1990s classified by the World Bank as socialist-style

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low-middle income economies. However, after transformation to a market economy most of the region managed to progress to the high income group [20].

Our aim was to investigate how the clinical characteristic of acute first-ever stroke patients admitted to the reference Polish urban stroke center has changed over the last two decades in terms of stroke etiology, vascular risk factors and their pre-stroke management.

2. Material and methods

The study center with a stroke unit provides neurological care for approximately 250.000 inhabitants of a highly urbanized area (Warsaw, Poland). We carried out a retrospective analysis of consecutive acute stroke patients admitted between July 1995 and December 2013. Data were prospectively collected in a detailed stroke registry [10] developed as an adaptation of the National Institute of Neurological and Communicative Disorders and Stroke Data Bank protocols [16]. Collected information included patients' demographics, comorbidities, medications, type of stroke, newly diagnosed diseases during hospital stay, routine laboratory and imaging findings and the course of stroke throughout the hospital stay.

The diagnosis of stroke was based on clinical symptoms according to the World Health Organization (WHO) definition [42] and brain imaging (usually plain computed tomography). Stroke severity was measured with National Institutes of Health Stroke Scale (NIHSS). The pre-stroke level of disability was measured with modified Rankin Scale (mRS). During hospital stay all patients were scheduled for Doppler ultrasound of extra cranial arteries (carotid and vertebral), routine electrocardiography (ECG) and laboratory tests. If etiology of stroke was unknown or cardioembolic etiology was suspected, diagnostic workup included also 24-hour ECG monitoring and/or cardiac ultrasound. The etiology was determined according to the criteria from the Trial of Org 10172 in Acute Stroke Treatment (TOAST) Study [1].

We analyzed the time trends based on the consecutive time periods: 1995 to 1999 (group 1), 2000 to 2004 (group 2), 2005 to 2009 (group 3) and 2010 to 2013 (group 4).

2.1. Statistical methods

Categorical variables are presented as a number of valid observations with corresponding proportions. Due to non-normal distribution, continuous variables are presented as a median with interquartile range (1st quartile to 3rd quartile, IQR).

We compared the following time periods (e.g., group 3 vs group 2 and group 4 vs group 3) and each time period with the initial time period (e.g., group 4 vs group 1) using chi square test and Kruskal–Wallis test. To minimize the risk of type I error, pairwise comparisons were done only if the overall test was significant ($p < 0.05$). Calculations were carried out in STATISTICA 10.0 (Stat Soft Inc., Tulsa, USA, 2011).

3. Results

Studied population of 3973 acute first-ever stroke patients included 529 patients admitted in years 1995–1999, 1253 patients in years 2000–2004, 1320 patients in years 2005–2009 and 871 patients in years 2010–2013.

The proportion of males (45.2% in 1995–1999 to 46.2% in 2010–2013, respectively) has remained stable throughout the whole study period. Median age on admission has increased (from 72 to 76 years), as well as the proportion of patients over 80 years of age (from 26.3% up to 37.0%). The proportion of those with no pre-existing disability (defined as modified Rankin scale 0–1 points) has decreased from 84.3% in 1995–1999 to 67.4% in 2010–2013 (Table 1).

There was an increase in the proportion of patients with pre-existing diagnosis of hypertension (from 61.1% in 1995–1999 to 72.8% in 2010–2013). Total cholesterol level over 200 mg/dl was reported less often (from 57.7% to 34.9%) during the study period. More patients were diagnosed with atrial fibrillation (AF) during hospital stay (from 3.2% in 1995–1999 to 8.8% in 2010–2013). Newly diagnosed diabetes was more frequently reported only in time period 2005–2009 (Table 1). In 2005–2009 there has been a significant shift in the tobacco use pattern towards lower proportion of current smokers. In terms of alcohol use, more patients declared to be occasional drinkers instead of abstainers since 2000–2004.

Other vascular risk factors and concomitant diseases remained unchanged.

The pre-stroke use of antihypertensives in unselected patients and in patients with diagnosed hypertension has increased significantly from years 1995–1999 until years 2005–2009. A similar trend was observed for antiplatelet use in unselected patients and patients with pre-existing coronary artery disease, but the difference started to be significant in years 2000–2004 and progressed in years 2005–2009. The use of vitamin K antagonists became more prevalent in years 2005–2009 and then progressed in years 2010–2013, both in unselected patients and patients with pre-existing atrial fibrillation. The consistent increase of pre-stroke statins use has been observed since 2000 (Table 2).

Baseline neurological deficit has been fluctuating with a general trend towards less severe syndromes (from 9 to 6 NIHSS points) during the study period. The proportion of patients admitted to the hospital within 6 h from the onset of symptoms was stable until years 2005–2009 and has increased in the final time period (Table 3). Distribution of stroke subtypes according to TOAST classification has significantly changed in years 2005–2009 towards lower proportion of small-vessel disease and then remained stable, without affecting the proportion of patients with strokes of undetermined etiology (Table 3).

The use of extracranial arteries Doppler ultrasound and the use of 24-hour ECG Holter monitoring have increased (from 91.6% in 1995–1999 to 96.9% in 2010–2013 and from 26.7% to 62.5%, respectively). However, transthoracic echocardiography (ECHO) became much less prevalent (from 65.8% to 36.9%) during the study period. Since 2005–2009 there has been also a shift in the diagnosis of ipsilateral carotid stenosis, especially from the group with normal arteries to the group with confirmed atherosclerosis (see Table 4).

4. Discussion

To our best knowledge this is the first study from Central and Eastern Europe that investigates long term trends in the profile of first-ever acute stroke patients and their management in terms of primary prevention.

In our cohort mean age at stroke onset has significantly increased, which does not correspond with the findings from Western European countries [2,20,31,41]. For example, the proportion of stroke patients <55 years in the Dijon registry (France) increased from 12% in 1994 to 20% in 2011 [2]. In the United States the mean age of first-ever stroke has also decreased from 71 to 69.2 years between 1993 and 2005 [26]. Authors explained this by the higher prevalence of risk factors such as obesity and diabetes seen in the young Americans. Our findings stay in line with Chinese reports, in which median age of first-ever stroke patients increased over the last two decades, however notably only in men [45]. This discrepancy may be at least partly explained by significant improvement of life expectancy in Poland during the study period (by 5.1 years in men and 4.6 years in women) [37], as well as improved detection and management of concomitant diseases, especially in highly urbanized areas with good access to healthcare such as Warsaw. It also matches the data from the Global Burden of Disease Study, as mean age at ischemic stroke in low-to-middle income countries was in 1990 estimated to be 70 years, whilst in high-income countries in 2010 it was 76 years [28]. The proportion of elderly in the community is considered a strong predictor of increasing stroke incidence, which is consistent with our findings [32].