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Epidemiology of Stroke and Survival Rate of Patients after Admission to Hospitals in Kazakhstan

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Abstract

BACKGROUND: According to the official statistics of the Ministry of Health, 40 thousand cases of stroke are registered annually in Kazakhstan. Meanwhile, the study of issues of organization of medical care in the admission of patients with stroke to hospitals in Kazakhstan remains relevant and requires a number of decisions to improve care.

AIM: The aim of the study was to study the prevalence of stroke among the population of Kazakhstan and the organization of medical care in hospitals for the years 2018–2020.

METHODS: The data were obtained from the Information System "Electronic Register of Dispensary Patients." More than 60.0% of patients diagnosed with cerebral infarction caused by cerebral artery thrombosis were admitted to the hospital.

RESULTS: The availability of medical care for stroke is of great importance. As the analysis of survival rate showed, the average survival time directly depends on the patient's condition at admission to hospitals. The survival rate of patients with various nosologies of cerebral circulation in men and women differs significantly and reaches 80 years.

CONCLUSION: The correct organization of the management of medical care for patients with acute circulatory disorders is of paramount importance. It is necessary to strengthen the integration and coordination of the systems of emergency care and primary health care.

Introduction

Stroke is characterized by impaired blood circulation in the brain. Hypertension is a risk factor, and for stroke prevention, lowering blood pressure is more important than choosing antihypertensive medications. Lifestyle factors that have been found to reduce stroke risk include reducing salt intake, avoiding smoking, regular physical activity, and maintaining normal body weight [1].

Ischemic stroke is classified as phenotypic and causal. This is related to the description of concomitant underlying diseases and the establishment of the cause of morbidity [2].

The study found that treatment in the stroke unit reduced the odds of death during one year of follow-up (odds ratio (OR) 0.87, 95% confidence interval (CI) 0.69–0.94; p = 0.005), odds of death or hospitalization (OR 0.78, 95% CI 0.68–0.89; p = 0.0003), and odds of death or dependence (OR 0.79, 95% CI 0.68–0.90; p = 0.0007). Study results were independent of patient age, sex, severity of initial stroke, or type of stroke, but there were no data on length of hospital stay [3].

Worldwide, the incidence of stroke is about 17 million people and is the second leading cause of death in the population [4], [5], [6].

Mortality from stroke among those under 65 years of age is due to smoking, atrial fibrillation, heart failure, and heart attack. With fairly effective control of blood pressure, the incidence of stroke has declined in many developed countries. However, due to an aging population, the absolute number of strokes continues to increase [7].

The economic burden of stroke is about $33 billion a year, and it accounts for medical services, medications, including rehabilitation and lost productivity [5].

The American Heart Association predicts that the total cost of stroke treatment, which includes both direct and indirect costs, will increase from $105.2 billion in 2012 to $240.7 billion by 2030 [8].

In 2020, there were 7.08 million cerebrovascular disease-related deaths worldwide (3.48 million deaths from ischemic stroke, 3.25 million deaths from intracerebral hemorrhage (ICH) and 0.35 million from subarachnoid hemorrhage). The highest rates of total stroke deaths are found in Central, Southeast and East Asia, Oceania, and sub-Saharan Africa. Eastern Europe and Central Asia have the highest rates of ischemic stroke-related mortality [9].

The INTERSTROKE study found that ten risk factors accounted for 88% of all strokes. The way this

study disseminates information about stroke is based on the use of an internationally proven cell phone app that can calculate a person's stroke risk and inform people about the symptoms and warning signs of stroke [10].

In a study conducted according to the National Clinical Stroke Registry, incidence, mortality, and morbidity rates worldwide confirm the inequalities and magnitude of the burden in low- and middle-income countries. That said, the data were limited, suggesting the need for more research on stroke [11].

The effectiveness of timely medical care, including fibrinolytic therapy in accordance with clinical treatment and diagnostic protocols largely depends on a multidisciplinary team consisting of practicing physicians, nurses, and laboratory staff [12], [13].

Around the world, stroke patients are managed using mobile stroke units (MSUs) in the emergency department. Mobile emergency stroke units are equipped with computed tomography (CT) for multimodal brain imaging, on-site blood work, telemedicine to stroke centers and specialized teams [14]. However, their use remains suboptimal in low- and middle-income countries than in high-income countries [15].

The World Health Organization (WHO) has pledged to make efforts to significantly reduce risk factors and mortality from non-communicable diseases, including stroke, by 2025 [16].

In 2014, the World Stroke Organization (WSO) published the first Global Guide to Stroke Services. Based on this guide, a model was developed that categorizes the availability of stroke services worldwide into three levels: access to minimal medical services, access to basic stroke services, and access to advanced stroke services [17].

As defined by the World Health Organization (1970), "A stroke is a rapidly developing clinical sign of focal (or global) impairment of brain function, with symptoms lasting 24 h or more, or leading to death, for no apparent cause other than vascular origin." [18]. More recently, a new definition of stroke, including clinical and tissue criteria, has been proposed by the American Stroke Association of the 21st Century. Ischemic stroke accounts for 80% of stroke cases, whereas hemorrhagic stroke accounts for 20%, with the actual proportions of stroke types depending on the population [19].

The burden of stroke appears to be shifting to developing countries, where there are now 4.85 million stroke deaths and 91.4 million DALYs annually, compared with 1.6 million deaths and 21.5 million DALYs in high-income countries. Risk factors for stroke, which include high blood pressure, smoking, obesity, diabetes mellitus, atrial fibrillation, dyslipidemia, and physical inactivity, are preventable. However, it should be noted that the absolute number of stroke cases increased, stroke-related survivors and deaths, and lost DALYS in low- and middle-income countries [20].

Targeting risk factors such as these may have already contributed to the observed improvements in stroke incidence, mortality, and disability-adjusted life expectancy (DALYs) in high-income countries over the past two decades. However, the absolute number of stroke cases, stroke-related survivors and deaths, and lost DALYS has increased, in part because of increases in low- and middle-income countries [21].

Failure to recognize the warning signs of stroke is an important contributing factor to late hospital admission of stroke patients [22].

Quality of life in stroke patients is defined by QALE loss in QALY units, which provides insight into the effectiveness of diagnosis and treatment. Over a lifetime, ischemic stroke patients show a 10.2 versus 7.5 quality-adjusted life-year (QALY) improvement compared with patients with intracerebral hemorrhage (ICH). Quality of life is significantly lower in patients with VIC compared with stroke patients (16.3 and 8.5 QALYs) [23].

Methods

Data stroke of cases were obtained from the electronic database of hospitals about stroke cases in Kazakhstan during the period from January 1, 2018, to December 31, 2020.

Patients with newly diagnosed stroke aged 18 years or older were included in the study. Cerebrovascular diseases (I60-I69) were coded as I60-I64 according to the 10th revision of the International Classification of Diseases. Patients under 18 years of age and those who are not residents of Kazakhstan were excluded from the analysis.

Ethical issues

The ethics committee of the Local Ethical Committee of the Kazakhstan Medical University "KSPH" approved this study (IRB –A161 24.03.2022).

Statistical analysis

Statistical analysis was performed using SPSS IBM 28.0 software (SPSS Inc., Chicago, Illinois, USA). All parameters were described as median values, including their interquartile range (IQR). $p < 0.001$ was considered significant. Continuous values were analyzed by the t-test. Mann–Whitney U tests were used for nonparametric (no distribution) variables. A Chi-square test was used to compare discrete variables. Data processing was performed using the data analysis package of the "Excel 365" tabular processor Microsoft® Office, "SPSS Statistics version 28" for Windows.

Sample size

During the January 1, 2018, and December 31, 2020, period 2044 patients admitted to a general hospital were diagnosed as suffering from a cerebrovascular event in Kazakhstan.

Results

In the population, stroke were detected (n = 2044) in 58.0% of men and in 42.0% of women. A one-sample normal Kolmogorov–Smirnov criterion for the age distribution of stroke patients with mean age parameters of 68 years. Data on stroke patients by gender and age are shown in Figure 1.

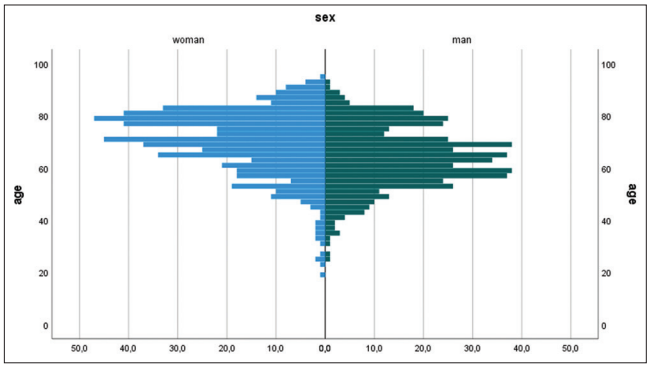

Figure 1: Stroke patients by gender and age

According to the official data 85.3% (n = 2044) of patients with acute stroke were delivered by ambulance, 10.0% (n = 205) of patients applied independently for medical help to the hospital. About 2.3% (n = 47) were delivered to other hospital (Figure 2).

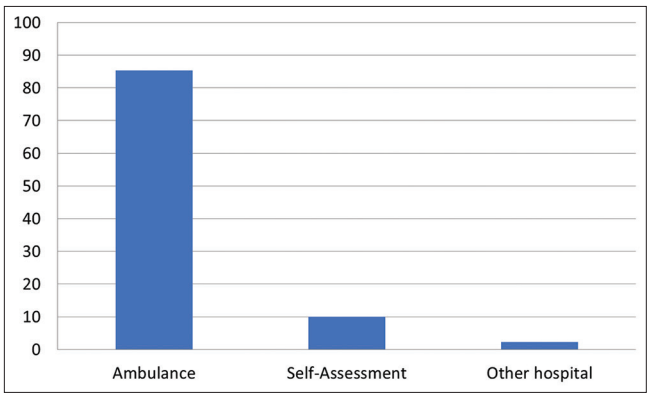

Figure 2: Referral of stroke patients

On admission to hospital inpatients, patients were diagnosed brain infarction caused by cerebral artery thrombosis – 64.1%, carotid artery syndrome (hemispheric) – 20.1%, and intracerebral hemorrhage in the cortical hemisphere – 10.8% (Figure 3).

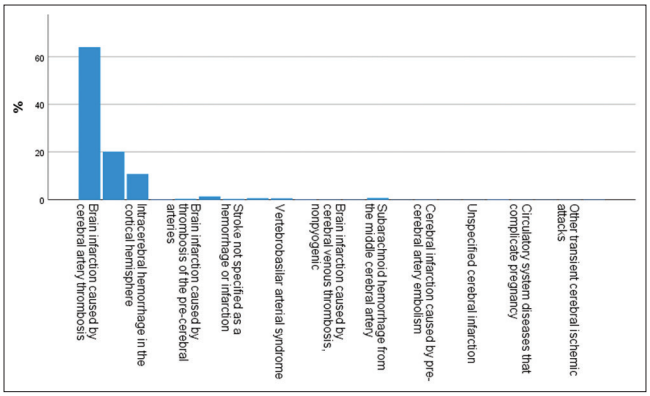

Figure 3: Diagnosis of stroke patients in the hospital

According to the International Classification of Diseases, Revision 10 (ICD-10), the most frequent nosologies among patients with stroke include 163.3 brain infarction caused by cerebral artery thrombosis (62.8%), G45.0 - transient cerebral ischemic attacks (20.2%) and related syndromes, and 161.1 - intracerebral cortical hemorrhage (10.2%) (Figure 4).

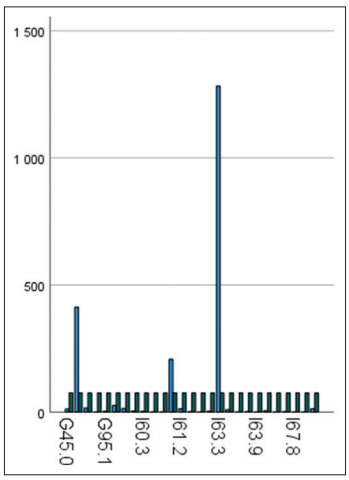

Figure 4: The most common ICD-10 codes for stroke patients

The greatest number of bed-days spent by stroke patients in hospital was 10 days - 18.5%, 11 days - 13.2%, and 12 days - 9.4%. The results are presented in Figure 5.

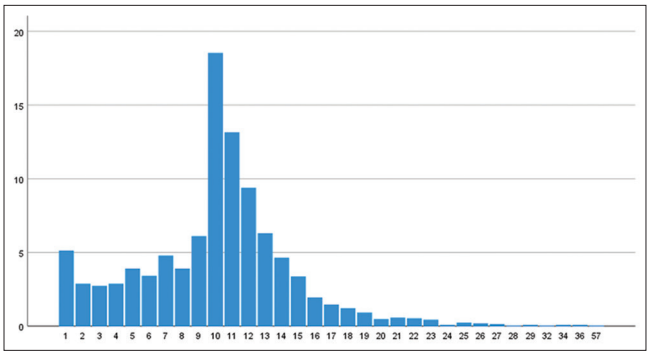

Figure 5: Hospital bed-days of stroke patients in %

The outcome of patients with improvement was 85.8% (n = 1754), with recovery was 0.1% (n = 2), and no change in health status was 5.9% (n = 120).

A mortality rate of 8.2% (n = 168) of patients with acute cerebral circulation disorder was established (Figure 6).

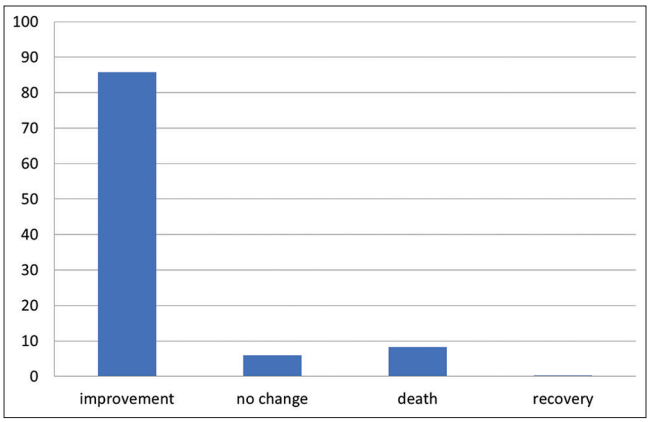

Figure 6: Hospital stroke patient outcome

Based on the results of the treatment 60% patients paid 126 thousand 660 Tenge, 22% patients - 85 thousand 146 Tenge and 10.5% patients - 170 thousand 611 Tenge (Figure 7). Considering the fact that the average monthly salary in the country is - 70 thousand Tenge.

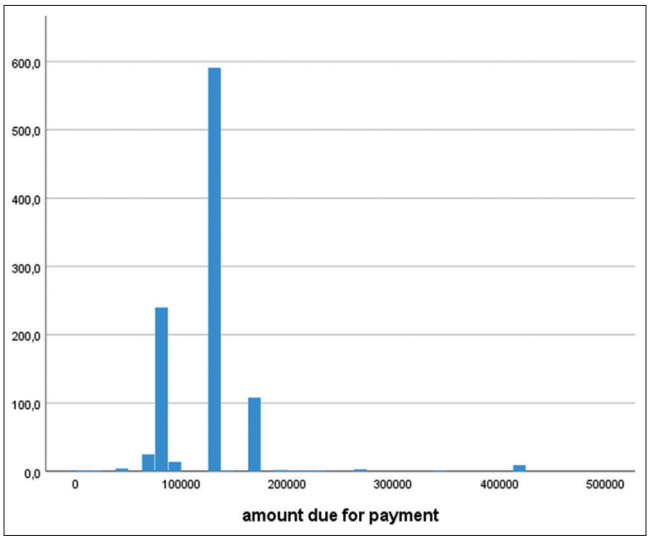

Figure 7: Payment treatment in hospital

Figures 8 and 9 show the average survival time of patients, taking into account the gender of the patient and the diagnosis made on admission to the hospital.

An analysis of stroke survival showed that in men and women brain infarction, cerebral artery occlusion, hemorrhagic stroke, and cerebrovascular disease, the survival rate decreases significantly after age 80.

Discussion

The global burden of stroke remains high despite the decrease in mortality. Primary prevention should primarily target people with risk factors and include an integrated, comprehensive approach [24].

A strategic plan to improve stroke care contains stroke awareness, education, prevention, and treatment that will enable organizations and communities to act at all levels [25].

The prevalence of stroke declined from 1990 to 2019 in Central (Slovenia, Czech Republic, and Hungary) and Eastern European countries (Estonia) and there is a health care gap. Age-standardized disability-adjusted life years lost (DALYs) for stroke declined in the three European regions and in all twenty Central and Eastern European countries, but at different rates. Lost years of life (YLL) accounted for more than 70% of DALYs for stroke and more than 90% of DALYs for men in Eastern European countries [26].

Stroke patients in poorer countries suffer because of inadequate primary care to control risk factors, such as hypertension, and inadequate emergency care systems. In this regard, the strategic directions are, first, that care should focus on strengthening, integrating, and coordinating primary care and emergency systems for stroke prevention. Second, care should focus on community-based programs to reduce stroke risks and improve stroke outcomes [27].

The planning and implementation of strategies to prevent and control stroke and its risk factors are at the forefront. Health promotion strategies aimed at the prevention and control of cardiovascular risk factors, early detection of disease, and treatment of acute and chronic cardiovascular disease are important elements in reducing the burden of disease [28].

Compared with working 35–40 h/week, working ≥55 h/week could result in a moderate, clinically significant increase in stroke risk when followed for 1–20 years (OR 1.35, 95% CI 1.13–1.61, 7 studies, 162 644 participants, I 2 3%, mean quality of evidence). Subgroup analysis found no evidence of differences by the WHO region, age, gender, socioeconomic status, or type of stroke [29].

In Kazakhstan in 2015 the Roadmap for implementation of an integrated model of acute stroke management was approved. For efficiency of implementation and monitoring of measures of the Roadmap the republican indicators of stroke service in the Republic of Kazakhstan were developed and approved. One of important indicators of stroke service of the RK is availability of stroke centers in regions, which is expressed in efficiency indicator “Percentage of medical organizations providing care for stroke of II and III levels,” which is calculated according to the Order of the Ministry of Health and Social Development of the Republic of Kazakhstan No 809 of 19.10.2015 “On approval of standard of organization of neurological care in the Republic of Kazakhstan.”

However, further research is needed to determine the causes associated with risk factors for stroke that cause hospital admissions.

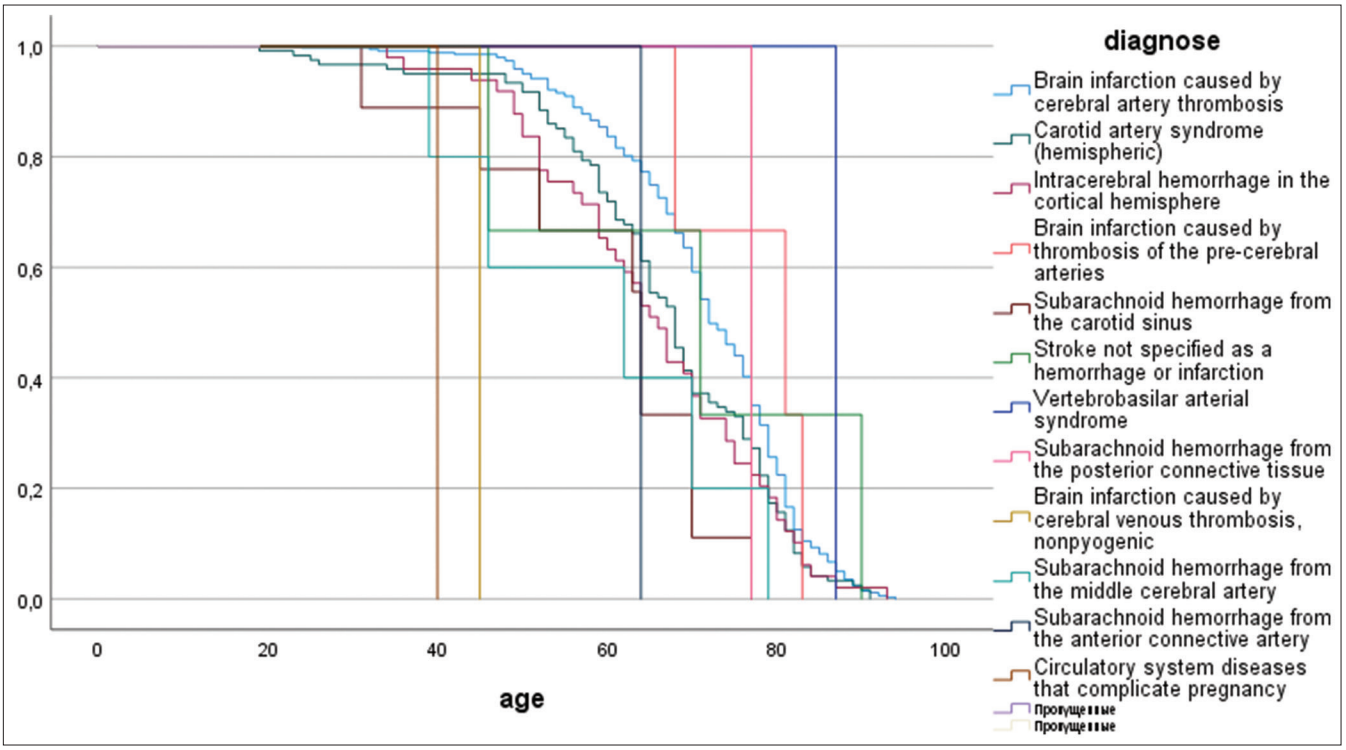

Figure 8: Survival function for male patients according to diagnosis

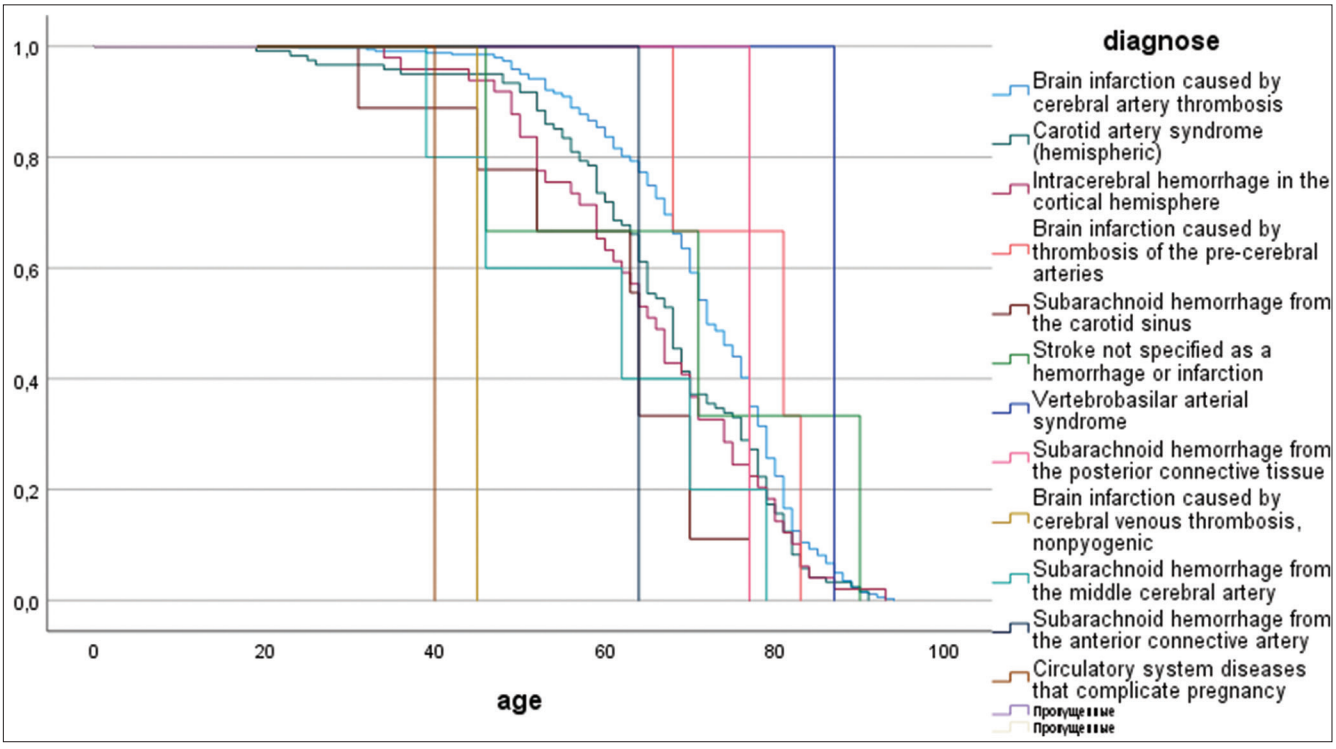

Figure 9: Survival function for female patients according to diagnosis

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