

UDC: 615.276-047.37

DOI: <https://doi.org/10.20998/BMPP.2024.02.05>**M. Mishchenko¹, V. Ponomaryov², O. Mishchenko², S. Voloshyna²**¹ Kharkiv National Medical University, Kharkiv, Ukraine.² Educational and Scientific Medical Institute of the National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine.**MEDICAL AND SOCIAL ASPECTS OF CIRCULATORY SYSTEM DISEASES, CEREBROVASCULAR DISEASES AND CEREBRAL STROKES***Summary*

Introduction. In recent years, cardiovascular diseases (CVDIS), especially circulatory diseases (CDS), cerebrovascular diseases (CVDS) and cerebral strokes (CS), have been ranked first in terms of prevalence, mortality and disability of the entire world population.

Purpose of the study. To analyze the epidemiological situation regarding the prevalence of CDS, CVDS and CS and their medical and social consequences in Ukraine and Kharkiv region.

Materials and methods. Data from official sources of statistical information of Ukraine (State Institution "Center for Medical Statistics of the Ministry of Health of Ukraine") were used.

The results. A decrease in the prevalence of all diseases and illnesses detected for the first time in life in Ukraine was determined for CDS (trends -16.3% and -28.0%) and CVDS (-22.8% and -24.1%) and CS and a significant increase in the primary prevalence for CS (+83.9%). An increase in mortality rates in Ukraine due to CDS and CVDS per 100 thousand people was noted: trends of +2.3% and -13.6%, respectively. An increase in the level of primary disability among the adult population has been identified for all diseases (trend +3.7%), as well as for CDS (+5.8%) and CVDS (+8.3%). Trends in the decline of CDS and CVDS in the Kharkiv region have been identified: -10.8% and -14.1% (all diseases) and -44.3% and -31.3% (newly diagnosed). Significant growth rates of the prevalence of CS were determined both for the total morbidity (trend +62.5%) and for those detected for the first time in life (+249.2%). An increase in mortality rates in the adult population of the region due to CDS and CVDS with trends of +1.9% (absolute values) and +4.9% (per 100 thousand population) was noted. There was an increase in the levels of primary disability for all diseases, CDS and CVDS among the adult population of the Kharkiv region with the corresponding trends for absolute values: +2.4%, +10.1% and +24.3% and rates per 10 thousand people: +4.9%, +12.1% +25.6%.

Conclusions. The trends in the growth of CDS, CVDS and CS among the adult population of our country, the city of Kharkiv and Kharkiv region have been determined.

Key words: cardiovascular diseases, circulatory system diseases, cerebrovascular diseases, cerebral strokes, DALY, YLD, YLL.

M. М. Міщенко¹, В. І. Пономарьов², О. М. Міщенко², С. Л. Волошина²¹ Харківський Національний медичний університет, Харків, Україна.² Навчально-науковий медичний інститут Національного технічного університету «Харківський політехнічний інститут», Харків, Україна.

УДК: 615.276-047.37

МЕДИКО-СОЦІАЛЬНІ АСПЕКТИ ХВОРОБ СИСТЕМИ КРОВООБІГУ, ЦЕРЕБРОВАСКУЛЯРНИХ ЗАХВОРЮВАНЬ І МОЗКОВИХ ІНСУЛЬТІВ

Вступ. Серцево-судинні захворювання (ССЗ), особливо хвороби системи кровообігу (ХСК), цереброваскулярні захворювання (ЦВЗ) і мозкові інсульти (МІ) останніми роками посідають перші місця за поширеністю, смертністю та інвалідизацією усього світового населення.

Мета дослідження. Проаналізувати епідеміологічну ситуацію щодо поширеності ХСК, ЦВЗ і МІ та їх медико-соціальних наслідків в Україні та Харківській області.

Матеріали та методи. Використано дані офіційних джерел статистичної інформації України (Державного закладу «Центр медичної статистики Міністерства охорони здоров'я України»).

Отримані результати. Визначено зниження поширеності усіх захворювань і хвороб, виявлених вперше в житті в Україні для ХСК (тренди -16,3 % і -28,0 %) та ЦВЗ (-22,8 % й -24,1 %) й МІ та значного збільшення первинної – для МІ (+83,9 %). Констатовано збільшення рівнів смертності в Україні через ХСК і ЦВЗ на 100 тис. населення: відповідно тренди +2,3 % і -13,6 %. Визначено збільшення рівнів первинної інвалідності серед дорослого населення як за усіма захворюваннями (тренд +3,7 %), так і за ХСК (+5,8 %) та ЦВЗ (+8,3 %). З'ясовані тренди зниження ХСК і ЦВЗ в Харківській області: -10,8 % і -14,1 % (усі захворювання) та -44,3 % і -31,3 % (вперше виявлені). Визначено значні темпи зростання поширеності МІ як для загальної захворюваності (тренд +62,5 %), так і для виявлених вперше в житті (+249,2 %). Констатовано збільшення показників смертності дорослого населення області через ХСК і ЦВЗ з трендами +1,9 % (абсолютні значення) і +4,9 % (на 100 тис. населення). Зафіксовано збільшення рівнів первинної інвалідності за усіма захворюваннями, ХСК і ЦВЗ серед дорослого населення Харківської області з відповідними трендами для абсолютних значень: +2,4 %, +10,1 % і +24,3 % і показниками на 10 тис. населення: +4,9 %, +12,1 % +25,6 %.

Висновки. Визначено тренди зростання ХСК, ЦВЗ і МІ серед дорослого населення нашої держави, міста Харкова та Харківської області.

Ключові слова: серцево-судинні захворювання, хвороби системи кровообігу, цереброваскулярні захворювання, мозкові інсульти, DALY, YLD, YLL.

Introduction. Scientists have determined [1] that the last two decades have been marked by an increase in the prevalence and mortality due to non-communicable diseases, especially cardiovascular diseases (CVDs), diabetes mellitus, and cancer. For example, in 2000, the main causes of mortality were four non-communicable diseases, and in 2019, there were already seven such diseases (due to an increase in average global life expectancy by six years and the prevalence of risk factors such as sedentary lifestyle, obesity, hypertension, tobacco smoking, alcohol abuse, etc.): coronary heart disease (CHD), cerebral strokes (CS), chronic obstructive pulmonary disease, lower respiratory tract infections, neonatal diseases, tracheal, bronchial and lung cancer, various forms of dementia, diarrhea, diabetes mellitus and kidney disease [2].

Among these diseases, the leading place is occupied by CVDs, which in recent years have been identified as one of the main medical and social global problems of modern medicine and health care, due to the threatening prevalence rates and provoking significant negative medical and social consequences (mortality and disability, Disability-adjusted life years (DALYs) and Years lived with disability (YLD), etc.) CVDIS (such as CHD, cardiomyopathy, atherosclerosis, hypertension, CS and chronic heart failure) are among the leading causes of morbidity and mortality worldwide [3].

At the same time, these negative trends are explained by another feature of CVDIS that has been noted recently, which is its constant and progressive rejuvenation, which provokes the development of these negative medical and social trends among the working population [4–6]. At the same time, according to current forecasts, these trends will provoke a more significant deterioration in the global and domestic medical and demographic situation (which is

confirmed by the fact that our country currently has the leading positions among EU countries in terms of disability and mortality due to the most common CVDs – CHD, circulatory system diseases (CDS) and CS) [7].

According to many studies [8, 9], CVDs cause significant reductions in the quality of life of the world's population [10, 11] and are the main cause of mortality and disability both worldwide and in our country, which leads to significant increases in economic costs of health care. For example, researchers [12, 13] estimate that about 16.5–17.5 million people die annually due to CVDIS, which is significantly higher than the mortality rate from neoplasms and other non-communicable diseases. At the same time, WHO experts predict an increase in mortality rates caused by CVDIS to 24.1–24.3 million cases by 2030 [14]. The Global Burden of Disease (GBD) study and others (2017) [9] reported mortality due to CVDIS at the level of 17.8 million global deaths (233.1 cases per 100 thousand people; 330 million lost life years and 35.6 million DALYs), and according to 2019 [15], CVDIS caused about 6.2 million global deaths of people aged 30 to 70 years.

It should be noted that according to GBD estimates for 1990–2017 the CVD mortality rate decreased in high-income countries (from 271.8 (95.0% confidence intervals (CI) 270.9–273.5) to 128.5 (95.0% CI 126.4–130.7) per 100 thousand population), while low- and middle-income countries did not show significant changes (from 368.2 (95.0% CI 335.6–383.3) to 316.9 (95.0% CI 307.0–325.5) per 100 thousand) [16]; although other studies [15] reported that the prevalence of CVDIS in 2017–2019 almost doubled from 271 million cases (95.0% CI 257–285 million) to 523 million (95.0% CI 497–550 million), and the number of deaths due to CVDIS steadily increased from 12.1 million (95.0% CI 11.4–12.6 million), reaching 18.6 million global deaths in 2019

(95.0% CI 17.1–19.7 million). According to Naghavi M. et al. (2017), the global age-standardized CVD mortality rates for 2006–2016 decreased by 14.5% [17]. At the same time, there was a significant increase in the number of DALYs and the expected average Years of life lost (YLL) and YLD, which doubled from 17.7 million (95.0 CI 12.9–22.5 million) in 2017 to 34.4 million (95.0% CI 24.9–43.6 million) in 2019.

It should be noted that a similar trend is also observed in almost all countries of the world community: in China (2016), CVDs caused more than 40.0% of all deaths [18]; in Brazil (2017) – 28.0% of all deaths and deaths of people aged 18 to 65 years; in the United States of America (2016) – 28.0% of all deaths and 38.0% of deaths of people aged 18 to 65 years; in the United States of America (2016) CVDIS ranked first in the causes of mortality and amounted to about 900 thousand deaths [19] with a mortality rate per 100 thousand inhabitants of 262.3‰ [20, 21]; in India – 209.1‰ [22].

Moreover, quite interesting statistics were obtained by researchers [23] who identified trends in the incidence of CVD among the member countries of the European Society of Cardiology (ESC). Thus, in 2017, there were 108.7 million patients with CVD in 54 ESC member countries. The average age-standardized prevalence per 100 thousand inhabitants of each country was 6595 (interquartile range (IQR) 6184–7108), ranging from 5254 in Norway to 8766 in Bulgaria. At the same time, in the ESC member countries, there were more women than men with CVDIS (55.7 and 52.9 million, respectively). The average age-standardized prevalence rates per 100 thousand people were lower for women compared to men (6190 (IQR 5529–6842) and 7250 (IQR 6661–7793), respectively). Values per 100 thousand women ranged from 4421 in Norway to 8128 in the Czech Republic, and for men – from 6156 in Cyprus to 9674 in Bulgaria.

In addition, the average age-standardized prevalence of CVDIS per 100 thousand inhabitants was higher in middle-income countries than in high-income countries (7022 (IQR 6562–7354) and 6245 (IQR 5785–6911), respectively). The age-standardized prevalence per 100,000 people in middle-income countries ranged from 5976 in Moldova to 8766 in Bulgaria, and in high-income countries from 5254 in Norway to 8457 in the Czech Republic.

At the same time, the average number of DALYs due to CVDIS in 2017 was 4530 (IQR 2179–6463) per 100 thousand inhabitants of ESC countries and ranged from less than 1600 in Switzerland, Israel and France to more than 10 thousand in Ukraine and Egypt. It should be noted that the main causes of DALYs due to CVDIS were CHD and CS (54.0% and 27.0%, respectively). In addition, the average age-standardized DALY due to CVDIS per 100 thousand women was 3219 (IQR 1597–5324): from 1114 in France to 7657 in Morocco; and for men – 5925 (IQR 2810–8124) in the range from 1938 in Switzerland to 15077 in Ukraine. CHD was the main reason for the difference between women and men with almost threefold difference for DALYs: 1384 (IQR 615–2423) and 3145 (IQR 1513–5261) per 100 thousand people, respectively. For CS, the DALYs per 100 thousand people were more comparable and amounted to 951 (ICR 481–1730) for women and 1255 (ICR 612–2426) for men, respectively.

DALYs were also affected by national income status. Thus, the average number of age-standardized DALYs due to CVDIS per 100 thousand people was significantly higher in middle-income countries compared to high-income countries (7160 (IQR 5655–8115) vs 2235 (IQR 1896–8115), respectively). The average age-DALYs due to CHD was 3910 (IQR 2788–4771) per 100 thousand inhabitants in middle-income countries compared to 1042

(IQR 797–1910) per 100 thousand inhabitants in high-income countries.

In addition, among the ESC member countries [15], age-standardized mortality rates caused by CVD were highest in Uzbekistan, Solomon Islands, and Tajikistan, and lowest in countries such as France, Peru, and Japan. At the same time, the levels of DALYs caused by CVD were highest for the Oceania Islands, Uzbekistan, and Afghanistan, and, respectively, lowest in Japan and France and Israel. According to gender values [15], in 2019, the levels of DALYs caused by CVDIS for men were highest at the age of 80–84 years, and lowest at the age of 30–60 years. In women, age-standardized DALYs were highest in Central Asia, Oceania, North Africa, and the Middle East and Eastern Europe; and lowest in Australia, Western Europe, and Asia-Pacific. For men, they were highest in Eastern Europe, Central Asia, and Oceania; and lowest in Australia, Western Europe, Asia and the Pacific, and Latin America. These national and regional differences can be explained by significant differences in the prevalence of CVD-related causes and the development of CVDIS and the different availability of medical care [24, 25].

According to the same studies, the prevalence of CVDIS is predicted to increase significantly among all world countries due to population growth and aging (especially in Central and South Asia, North Africa and West Asia, Latin America and the Caribbean, and East and Southeast Asia), which is why there is a significant need for a strategy for the prevention and control of CVDIS.

Our country is also characterized by significant levels of CVD prevalence and the negative medical and social consequences caused by them (mortality, disability, DALYs, YLL and YLD, etc.). The structure of CDS among the adult population includes hypertension (40.0%), CHD (27.0%), cerebrovascular diseases (CVD)

(16.5%) and other CDS (also 16.5%).

In the structure of annual mortality in our country, about 68.0% are CVDs (more than 430 thousand). Domestic mortality due to CVDs accounts for 67.0% of all deaths. The standardized mortality rate due to CVDIS is the highest among EU countries and is 801.6 per 100 thousand people) [7]. These are WHO statistics. CVD is the leading cause of death in Ukraine as well. Every year, 426 thousand Ukrainians die from CVDIS. Every day in Ukraine, 22 patients with acute myocardial infarction die in a hospital. In 2015, the mortality rate in hospitals from CVDIS in Ukraine was 3.6% [26].

At the same time, in Ukraine, mortality caused by CVDIS has increased by more than 8.0% over the past three decades (from 350605 deaths (56.5% of total deaths) in 2009 to 449376 cases (64.3%) in 2019).

In addition to the high prevalence of CVDs (primarily CDS) and the negative medical and social consequences caused by them (mortality and disability, significant levels of DALYs, YLL and YLD, etc.), global studies have identified a significant socioeconomic burden for both the health care system of all world countries and the population as a whole [27]. Given the significant contribution of CVDs to the growth of health care costs, in 2016, the Organization for Economic Cooperation and Development (OECD) first published the results of health care cost studies and determined that CVDs account for more than 10.0% of all these costs, as well as the largest share of inpatient care and pharmaceutical support [28]. At the same time, an estimate by the NHS in England determined that CVDIS cost the economy more than 7.4 billion pounds (6.0% of the total budget of the National Health Service in the UK) annually; these data increase dramatically to 15.8 billion if other costs of CVDIS support are added [29]. In France, 15.1 billion euros are allocated annually for CVDIS (more than 10.0% of all health care costs)

[30]. In the EU countries, Germany has the largest expenditures on CVDIS (34.7 billion euros (13.0% of total health care costs)). In other countries of the world community, there are also significant costs for the treatment and management of CVD, which causes the world community to lose a significant amount of financial costs, which provokes a high socioeconomic burden.

Purpose of the study. Thus, the aim of our study was to analyze the epidemiological situation regarding the prevalence of CDS, CVDS, and CS and their medical and social consequences in Ukraine and Kharkiv region.

Materials and methods. The study was conducted using data from official sources of statistical information of Ukraine (State Institution "Center for Medical Statistics of the Ministry of Health of Ukraine"). Systematic analysis and generalization were applied to the existing data from official sources.

Results and discussion. Trends in the prevalence of all diseases and diseases detected for the first time in life for CDS (respectively -16.3% (from 26523102 to 22199563 cases) and -28.0% (from 2397059 to 1725137)) and CVDS (-22.8% (from 3268100 to 2521601) and -24.1% (from 382916 to 290557)) were determined for 2010–2017 – Table 1.

Table 1. Prevalence of CDS, CVDS, and stroke among adults (18 years and older) in Ukraine in 2010–2017 [31–37]

| Diseases detected | | | | | |
|-----------------------------|----------------------------|----------|----------------------------|-------|----------------------------|
| 2010 | | 2017 | | trend | |
| all | for the first time in life | all | for the first time in life | all | for the first time in life |
| CDS I00–I99 | | | | | |
| 26523102 | 2397059 | 22199563 | 1725137 | -16,3 | -28,0 |
| CVDS I60–I69 | | | | | |
| 3268100 | 382916 | 2521601 | 290557 | -22,8 | -24,1 |
| Strokes (all forms) I60–I64 | | | | | |
| 110421 | 52739 | 96978 | 96978 | -12,2 | +83,9 |

Notes: excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Donetsk and Luhansk oblasts.

Despite the impossibility of one hundred percent calculation of these data, strokes showed a downward trend (-12.2%, from 110421 to 96978 cases) only for the total morbidity, and for the primary morbidity, the dynamics of their significant increase (+83.9%, an increase from 52739 to 96978 cases) was established – Table 1.

At the same time, without taking into account the impossibility of calculating accurate data after 2014, negative trends for 2013–2019 in mortality due to CDS and CVDS were identified (Table 2).

There were trends of decrease (-11.6%) in mortality due to CDS in absolute terms (from 440369 to 389348 cases) and increase per 100 thousand people (+2.3% increase trend: from 970.6 to 993.4‰). It should be noted that the urban population had a decrease in mortality due to CDS at the level of -11.6% in absolute terms (from 266287 to 235466 cases) and an increase per 100 thousand people (trend +3.1%: from 855.6 to 88.2‰). The rural population had only a downward trend in 2013–2019 (respectively -11.6% (decrease from 174082 to 153882

Table 2. Mortality from CDS and CVDS among the adult (18 years and older) population of Ukraine in 2013–2019 (abs.,‰) [38–41]

| Year | Died | | | | | | | | | | | |
|---------|-------------|-------|--------|-------|---------|----------|--------------|-------|-------|-------|---------|-------|
| | CDS I00–I99 | | | | | | CVDS I60–I69 | | | | | |
| | all | | city | | village | | all | | city | | village | |
| | abs. | ‰ | abs. | ‰ | abs. | ‰ | abs. | ‰ | abs. | ‰ | abs. | ‰ |
| Ukraine | | | | | | | | | | | | |
| 2013 | 440369 | 970,6 | 266287 | 855,6 | 174082 | 1221,655 | 94267 | 207,8 | 66121 | 212,5 | 28146 | 197,5 |
| 2019 | 389348 | 993,4 | 235466 | 882,2 | 153882 | 1205,6 | 76232 | 179,5 | 51774 | 178,3 | 24458 | 181,8 |
| Trend | -11,6 | +2,3 | -11,6 | +3,1 | -11,6 | -1,3 | -19,1 | -13,6 | -21,7 | -16,1 | -13,1 | -7,9 |

Notes: excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Donetsk and Luhansk oblasts.

cases) and -1.3% (from 1221,655 to 1205.6%) – Table 2.

As for CVDS-related mortality, there were only downward trends both in absolute values (among the total population -19.1% (from 94267 to 76232 cases), among urban – -21.7% (from 66121 to 51774) and rural – -13.1% (from 28146 to 24458)) and per 100 thousand people. population (total

population – -13.6% (from 207.8 to 179.5%), urban – -16.1% (from 212.5 to 178.3%) and rural – -7.9% (from 197.5 to 181.8%)) – Table 2.

It should be noted that the levels of primary disability among the adult population of our country in 2014–2018 showed negative trends in terms of their significant increase (Table 3).

Table 3. Primary disability among adults (18–100 years old) in Ukraine in 2014–2018 according to CDS and CVDS (abs.,‰) [42–45].

| Total persons recognized as disabled | | | | | |
|--------------------------------------|---|--------|------|-------|---|
| 2014 | | 2018 | | тренд | |
| abs. | ‰ | abs. | ‰ | abs. | ‰ |
| For all diseases | | | | | |
| 133745 | – | 138756 | 44,2 | +3,7 | – |
| CDS I60–I69 | | | | | |
| 30264 | – | 32031 | 10,2 | +5,8 | – |
| CVDS | | | | | |
| 12854 | – | 13927 | 4,4 | +8,3 | – |

Notes: excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Donetsk and Luhansk oblasts.

There was an increase in primary disability for all diseases in absolute terms of +3.7% (from 133745 to 138756 cases), due to CDS – an increase with a trend of +5.8% (from 30264 to 32031) and CVDS – +8.3% (from 12854 to 13927) – Table 3.

As for the Kharkiv region, according to the prevalence of CDS, CVDS and CS in 2010–

2017, significant rates of growth were recorded. significant rates of decline in CDS and CVDS were recorded for all diseases (the respective trends amounted to -10.8% (ninth place in terms of decline: from 1658424 to 1479342 cases) and -14.1% (twelfth place: from 249374 to 214184)), and in terms of diseases detected for the first

time in life (-44.3% (seventeenth place: from 234222 to 130466) and -31.3% (sixteenth place: from 40830 to 28044)). The prevalence of CS in most regions of our country (as well as in Kharkiv) had a significant increase: as a total morbidity in Kharkiv region with an increase trend of +62.5% (second place after Chernivtsi region (+69.4%)): from 4886 to 7941 cases; and newly diagnosed diseases: with trends of +249.2% (first place: growth from 2274 to 7941), outpacing the trends of increase identified in Ukraine as a whole (+83.9%: from 52739 to 96978 cases) [31–37]. It should be noted that in terms of the dynamics of adult mortality due to CDS and CVDS, Kharkiv region also showed an increase ([38–41]).

In general, in Ukraine, adult mortality due to CDS showed a downward trend in absolute values (downward trend -11.6%: from 440369 to 389348 cases), and Kharkiv region – an upward trend (upward trend +1.9%: seventh place in terms of growth (from 27547 to 28079)); and in terms of indicators per 100 thousand people. Population – in Ukraine, there was an increase with a trend of +2.3% (from 970.6 to 993.4%), as well as in Kharkiv region (trend +4.9%: seventh place in terms of growth (from 1009.5 to 1059.0%)). CVDS-related mortality among the adult population showed the same trends. In Ukraine as a whole, a decrease in these levels was noted both in absolute terms (downward trend of -19.1% (from 94267 to 76232 cases)) and per 100 thousand people (downward trend of -13.1%). population (downward trend -13.6%: from 207.8 to 179.5%), and in Kharkiv region, on the contrary, a decrease in absolute terms (downward trend -1.8% (fourteenth place in terms of decrease: from 5102 to 5009 cases)) and an increase per 100 thousand (+1.0%: eleventh place in terms of increase: from 187.0 to 188.9%).

In addition, in 2014–2018, there was an

increase in primary disability rates among both the adult population and the working-age population as a whole for all diseases and for CDS and CVDS.

Thus, in terms of the growth rate of primary disability for all diseases among the adult population, Kharkiv region ranked twelfth among all regions (growth trend +2.4%: from 8475 to 8678 cases) in absolute terms and seventh in terms of growth per 10 thousand people (trend +4.9%: from 36.8 to 38.6%). In Ukraine, in terms of absolute values, there was a corresponding increase with a trend of +3.7% (from 133745 to 138756 people) [42–45].

It has been determined that in terms of the growth rate of primary disability among the adult population according to the CDS, Kharkiv region ranked tenth during this period with a growth trend of +10.1% (increase from 2086 to 2296 cases) in absolute values and fifth – per 10 thousand people (trend +12.1%: from 9.1 to 10.2%). In Ukraine, the corresponding increase in primary disability among the adult population amounted to +5.8% (from 2086 to 2296 newly recognized as disabled) in absolute terms.

In terms of the growth of primary disability among adults according to the CVDS, Kharkiv region ranked third in absolute terms after Luhansk (+129.6% trend: increase from 98 to 225 cases) and Donetsk (+50.9% trend: from 452 to 682) regions with values of +24.3% (increase from 888 to 1104 newly recognized persons with disabilities) and first - per 10 thousand people (+25.6% trend: from 3.9 to 4.9% of the population). In Ukraine, the corresponding increase was +8.3% (from 12854 to 13927 people).

The growth rate of primary disability among the able-bodied population in 2014–2018 for all diseases in the Kharkiv region was +1.3% (tenth place in terms of growth: from 7250 to 7342 people) in absolute terms and +0.4% (seventh place: from 45.7% to 45.9%

of people) in terms of 10 thousand people. In Ukraine, there was an increase in such persons by +3.5% (from 109040 to 112903) in absolute terms.

The growth rate of primary disability due to CDS among able-bodied persons during this period was +11.2% in absolute terms (eleventh place of growth: from 1664 to 1850 disabled persons) and +10.5% per 10 thousand people (seventh place: from 10.5% to 11.6%). Also, in Ukraine, an increase in the absolute value of primary disability was noted with a trend of +7.8% (from 21432 to 23107 cases). According to the CVDS, primary disability among able-bodied patients in Kharkiv region showed an increase of +29.8% (fourth place after Luhansk (+160.0%), Poltava (+49.9%) and Donetsk (+45.7%) regions: from 704 to 914 people) in absolute values and +29.5% (second after Poltava (+49.1%) region): from 4.4 to 5.7% per 10 thousand people. Ukraine had a corresponding increase with a trend of +11.8% (from 8694 to 9723 people) in absolute terms.

Our results are fully consistent with other global studies. Thus, among all CVDs, CDS, primarily CVDs (namely CS), occupy the top positions in terms of prevalence and negative medical and social consequences (mortality and disability, DALYs, YLL and YLD, etc. [46]. According to studies [47], CS is the second global cause of death after CHD and the first cause of disability in the world population [48]. According to other studies, CS causes 11.9% of all global deaths annually and ranks second in terms of mortality after CHD [49]. CS is the leading cause of temporary and permanent disability [50] because it leads to focal brain dysfunction depending on the affected area, which manifests itself in the form of motor and/or sensory deficits.

According to studies [51], the global prevalence of CS in different regions of the world community has significant differences and determines a total of up to 30 million new cases annually: European countries – more than 1.2 million, in economically developed countries (EU, Switzerland, Norway, Iceland) – more than 1.1 million, in the USA – more than 550 thousand. Thus, CS occurs at the level of 100-300 cases per 100 thousand of the world population (17 million cases), and the annual European prevalence of CS is 2–3 times higher in Eastern Europe than in Western Europe [52].

It should be noted that the total number of medical and social losses has been steadily increasing since 1990, reaching 101 million (95.0% CI 93.2–111 million) prevalent cases of CS in 2019 [53]. According to 2017 data, 6.2 million deaths (11.0% of all deaths, about 35.0% of all deaths due to CVDIS) [54] were reported worldwide, caused by CS. At the same time, Ahmad F. B. et al [55] determine that in the period from 2019 to 2020 alone, the estimated age-adjusted mortality rate due to CS increased by 15.9% (from 715.2 to 828.7 deaths per 100 thousand people).

Conclusions. Thus, the analysis has identified trends in the growth of CDS, CVDS, and CS among the adult population of our country, the city of Kharkiv, and the Kharkiv region.

Funding and conflict of interest. There is no conflict of interest.

Funding source: authors' own funds.

Publication ethics. The study complied with international ethical standards for biometric research.

REFERENCES

1. Лихота К. О., Закалюжний В. М. Серцево-судинні захворювання та здоров'я населення України : матеріали Міжнародної наук.-практ. конф. (Полтава, 27–28 трав. 2021 р.). Полтава : Астрія, 2021. С. 205–207.
2. Серцево-судинні захворювання — головна причина смерті. URL: <https://phc.org.ua/news/sercevo-sudynni-zakhvoryuvannya-holovna-prychyna-smerti> (дата звернення: 20.04.2024).
3. Ren J., Bi Y., Sowers J. R., et al. Endoplasmic reticulum stress and unfolded protein response in cardiovascular diseases. *Nature Reviews Cardiology*. 2021. Vol. 18. P. 499–521. doi: <https://doi.org/10.1038/s41569-021-00511-w>. PMID: 33762703.
4. Eberly L. A., Rusingiza E., Park P. H., et al. Understanding the etiology of heart failure among the rural poor in Sub-Saharan Africa: a 10-year experience from district hospitals in Rwanda. *Journal of Cardiac Failure*. 2018. Vol. 24 (12). P. 849–853. doi: <https://doi.org/10.1016/j.cardfail.2018.10.002>. PMID: 30315830.
5. Keates A. K., Mocumbi A. O., Ntsekhe M., Sliwa K., Stewart S. Cardiovascular disease in Africa: epidemiological profile and challenges. *Nature Reviews Cardiology*. 2017. Vol. 14 (5). P. 273–293. doi: <https://doi.org/10.1038/nrcardio.2017.19>. PMID: 28248242.
6. Owolabi M. O., Sarfo F., Akinyemi R., et al. Dominant modifiable risk factors for stroke in Ghana and Nigeria (SIREN): a case-control study. *The Lancet Global Health*. 2018. Vol. 6 (4). P. e436–e446. doi: [https://doi.org/10.1016/S2214-109X\(18\)30002-0](https://doi.org/10.1016/S2214-109X(18)30002-0). PMID: 29496511.
7. Андон'єва Н. М., Біловол О. М., та ін. Артеріальна гіпертензія та коморбідність : монографія / за ред. О. М. Біловола. Харків : ХНМУ, 2019. 176 с.
8. Zhou D., Xi B., Zhao M., et al. Uncontrolled hypertension increases risk of all-cause and cardiovascular disease mortality in US adults: the NHANES III linked mortality study. *Scientific Reports*. 2018. Vol. 8. Art. 9418. doi: <https://doi.org/10.1038/s41598-018-27377-2>. PMID: 29915316.
9. GBD 2017 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2018. Vol. 392 (10159). P. 1859–1922. doi: [https://doi.org/10.1016/S0140-6736\(18\)32335-3](https://doi.org/10.1016/S0140-6736(18)32335-3). PMID: 30415748.
10. GBD 2017 Causes of Death Collaborators. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2018. Vol. 392. P. 1736–1788. doi: [https://doi.org/10.1016/S0140-6736\(18\)32203-7](https://doi.org/10.1016/S0140-6736(18)32203-7). PMID: 30496103.
11. GBD 2017 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2018. Vol. 392. P. 1859–1922. doi: [https://doi.org/10.1016/S0140-6736\(18\)32335-3](https://doi.org/10.1016/S0140-6736(18)32335-3). PMID: 30415748.
12. Tilz R. R., et al. Management of ventricular tachycardia in the ablation era: results of the European Heart Rhythm Association Survey. *EP Europace*. 2018. Vol. 20 (1). P. 209–213. doi: <https://doi.org/10.1093/europace/eux332>. PMID: 29099950.
13. Мохначов О. В. Оптимізація діагностики та лікування гіпертонічної хвороби в умовах коморбідності : дис. ... канд. мед. наук. Полтава, 2019. 173 с.
14. Шапошніков Д. І., Радомський О. В. Аналіз епідеміологічної ситуації щодо хвороб системи кровообігу в Україні та Пакистані. *MEDSCOP 2019 : тези конф.* Полтава, 2019. С. 107.
15. Mensah G. A., Roth G. A., Fuster V. The Global Burden of Cardiovascular Diseases and Risk Factors: 2020 and Beyond. *Journal of the American College of Cardiology*. 2019. Vol. 74

- (20). P. 2529–2532. doi: <https://doi.org/10.1016/j.jacc.2019.10.009>. PMID: 31727295.
16. Naghavi M., et al. Global, regional, and national age-sex-specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*. 2017. Vol. 390 (10100). P. 1151–1210. doi: [https://doi.org/10.1016/S0140-6736\(17\)32152-9](https://doi.org/10.1016/S0140-6736(17)32152-9). PMID: 28919116.
17. GBD 2020 NCD Collaborators. Global, regional, and national progress towards Sustainable Development Goal 3.4 on non-communicable diseases: systematic analysis from the Global Burden of Disease Study 2020. *The Lancet*. 2022. Vol. 400 (10358). P. 1427–1460. doi: [https://doi.org/10.1016/S0140-6736\(22\)01412-7](https://doi.org/10.1016/S0140-6736(22)01412-7). PMID: 36306919.
18. Zhou M., et al. Cause-specific mortality for 240 causes in China during 1990–2013: a systematic subnational analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2016. Vol. 387 (10015). P. 251–272. doi: [https://doi.org/10.1016/S0140-6736\(15\)00551-6](https://doi.org/10.1016/S0140-6736(15)00551-6). PMID: 26510778.
19. Global Burden of Cardiovascular Diseases Collaboration. The Burden of Cardiovascular Diseases Among US States, 1990–2016. *JAMA Cardiology*. 2018. Vol. 3 (5). P. 375–389. doi: <https://doi.org/10.1001/jamacardio.2018.0385>. PMID: 29590344.
20. Kochanek K. D., Curtin S. C., Arias E., Murphy S. L. Deaths: Final Data for 2017. *National Vital Statistics Reports*. 2019. Vol. 68 (9). P. 1–77. PMID: 32501202.
21. Byrnes T., Huang D. Dysrhythmias and Hypertension. *Hypertension Journal*. 2020. Vol. 6. P. 12–17. doi: <https://doi.org/10.15713/ins.johtn.0176>.
22. India State-Level Disease Burden Initiative Collaborators (Dandona L., Kumar G. A., Shukla D. K., Paul V. K.). Nations within a nation: variations in epidemiological transition across the states of India 1990–2016. *The Lancet Oncology*. 2018. Vol. 19 (10). P. 1289–1306. doi: [https://doi.org/10.1016/S1470-2045\(18\)30447-9](https://doi.org/10.1016/S1470-2045(18)30447-9). PMID: 30219698.
23. Timmis A., et al. European Society of Cardiology: Cardiovascular Disease Statistics 2019. *European Heart Journal*. 2020. Vol. 41 (1). P. 12–85. doi: <https://doi.org/10.1093/eurheartj/ehz859>. PMID: 31838805.
24. Husain M. J., Datta B. K., Khan J., et al. Access to cardiovascular disease and hypertension medicines in developing countries: an analysis of essential medicine lists, price, availability, and affordability. *Journal of the American Heart Association*. 2020. Vol. 9. e015302. doi: <https://doi.org/10.1161/jaha.119.015302>. PMID: 32281532.
25. Khatib R., et al. Availability and affordability of cardiovascular disease medicines and their effect on use in high-, middle-, and low-income countries: an analysis of the PURE study data. *The Lancet*. 2016. Vol. 387 (10013). P. 61–69. PMID: 26498706.
26. Вороненко Ю. В., Шекера О. Г., Долженко М. М. та ін. Актуальні питання серцево-судинних хвороб у практиці сімейного лікаря. Київ : Видавець Заславський О. Ю., 2017. 414 с.
27. Treatment Regimes (тематичний випуск). *Current Pharmaceutical Design*. 2019. Vol. 25. P. 4063–4084. doi: <https://doi.org/10.2174/1381612825666190925163827>.
28. OECD. Expenditure by disease, age and gender — focus on health spending. 2016. URL: <https://www.oecd.org/els/health-systems/estimating-expenditure-by-disease-age-and-gender.htm> (дата звернення: 20.04.2024).
29. Public Health England. Health matters: preventing cardiovascular disease. GOV.UK. 2019. URL: <https://www.gov.uk/government/publications/health-matters-preventing-cardiovascular-disease/> (дата звернення: 20.04.2024).
30. Tuppin P., Danchin N., de Peretti C., et al. Prevalence and economic burden of cardiovascular diseases in France in 2013 according to the national health insurance scheme database. *Archives of Cardiovascular Diseases*. 2016. Vol. 109. P. 399–411. doi: <https://doi.org/10.1016/j.acvd.2015.12.004>. PMID: 27157728.
31. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2011 рік / ДЗ «Центр медичної статистики МОЗ України». 2011. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

32. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2012 рік / ДЗ «Центр медичної статистики МОЗ України». 2012. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

33. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2013 рік / ДЗ «Центр медичної статистики МОЗ України». 2013. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

34. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2014 рік / ДЗ «Центр медичної статистики МОЗ України». 2014. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

35. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2015 рік / ДЗ «Центр медичної статистики МОЗ України». 2015. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

36. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2016 рік / ДЗ «Центр медичної статистики МОЗ України». 2016. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

37. Статистичні дані форми № 12 «Звіт про захворювання, зареєстровані у хворих, які проживають у районі обслуговування лікувально-профілактичного закладу» за 2017 рік / ДЗ «Центр медичної статистики МОЗ України». 2017. URL: <http://medstat.gov.ua/ukr/statdan.html> (дата звернення: 20.04.2024).

38. Показники здоров'я населення та використання ресурсів охорони здоров'я в Україні за 2013–2014 роки / МОЗ України, ДЗ «Центр медичної статистики МОЗ України». Київ : ЦМС МОЗ України, 2015. 325 с.

39. Показники здоров'я населення та використання ресурсів охорони здоров'я в Україні за 2014–2015 роки / МОЗ України, ДЗ «Центр медичної статистики МОЗ України». Київ : ЦМС МОЗ України, 2015. 325 с.

40. Показники здоров'я населення та використання ресурсів охорони здоров'я в Україні за 2016–2017 роки / МОЗ України, ДЗ «Центр медичної статистики МОЗ України». Київ : ЦМС МОЗ України, 2018. 325 с.

41. Показники здоров'я населення та використання ресурсів охорони здоров'я в Україні за 2018–2019 роки / МОЗ України, ДЗ «Центр медичної статистики МОЗ України». Київ : ЦМС МОЗ України, 2020. 229 с.

42. Іпатов А. В., Козловська І. В., Литвиненко О. І., та ін. Основні показники інвалідності та діяльності МСЕК України за 2014 рік : аналітико-інформаційний довідник. Дніпропетровськ : Роял-Принт, 2015. 167 с.

43. Іпатов А. В., Козловська І. В., Литвиненко О. І., та ін. Основні показники інвалідності та діяльності МСЕК України за 2015 рік : аналітико-інформаційний довідник. Дніпропетровськ : Акцент ПП, 2016. 162 с.

44. Іпатов А. В., Козловська І. В., Литвиненко О. І., та ін. Основні показники інвалідності та діяльності МСЕК України за 2016 рік : аналітико-інформаційний довідник. Дніпро : Акцент ПП, 2017. 167 с.

45. Іпатов А. В., Козловська І. В., Литвиненко О. І., та ін. Основні показники інвалідності та діяльності МСЕК України за 2018 рік : аналітико-інформаційний довідник. Дніпро : Акцент ПП, 2019. 180 с.

46. Baatiema L., Chan C. K. Y., Sav A., Somerset S. Interventions for acute stroke management in Africa: a systematic review of the evidence. Systematic Reviews. 2017. Vol. 6 (1). P. 213. doi: <https://doi.org/10.1186/s13643-017-0594-4>. PMID: 29132310.

47. Shi Q., Cheng Q., Chen C. The Role of Autophagy in the Pathogenesis of Ischemic

Stroke. Current Neuropharmacology. 2021. Vol. 19 (5). P. 629–640. doi: <https://doi.org/10.2174/1570159x18666200729101913>. PMID: 32742619.

48. Favate A. S., Younger D. S. Epidemiology of Ischemic Stroke. Neurologic Clinics. 2016. Vol. 34. P. 967–980. doi: <https://doi.org/10.1016/j.ncl.2016.06.009>. PMID: 27741973.

49. Міщенко Т. С., та ін. Оцінка якості надання інсультної допомоги у стаціонарах за даними реєстру RES-Q. Міжнародний неврологічний журнал. 2020. Vol. 16 (1). P. 10–16. doi: <https://doi.org/10.22141/2224-0713.16.1.2020.197325>.

50. Adair T., Lopez A. D. The role of overweight and obesity in adverse cardiovascular disease mortality trends: an analysis of multiple cause of death data from Australia and the USA. BMC Medicine. 2020. Vol. 18 (1). P. 199. doi: <https://doi.org/10.1186/s12916-020-01666-y>. PMID: 32698818.

51. Johnson W., Onuma O., Owolabi M., Sachdev S. Stroke: a global response is needed. Bulletin of the World Health Organization. 2016. Vol. 94. P. 634a. doi: <https://doi.org/10.2471/blt.16.181636>. PMID: 27708465.

52. Norrving B., et al. Action Plan for Stroke in Europe 2018–2030. European Stroke Journal. 2018. Vol. 3 (4). P. 309–336. doi: <https://doi.org/10.1177/2396987318808719>. PMID: 30693024.

53. Roth G., Mensah G. A., Johnson C. O., et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990–2019. Journal of the American College of Cardiology. 2020. Vol. 76 (25). P. 2982–3021. doi: <https://doi.org/10.1016/j.jacc.2020.11.010>. PMID: 33309175.

54. Yuyun M. F., Sliwa K., Kengne A. P., et al. Cardiovascular Diseases in Sub-Saharan Africa Compared to High-Income Countries: An Epidemiological Perspective. Global Heart. 2020. Vol. 15 (1). P. 15. doi: <https://doi.org/10.5334/gh.403>. PMID: 32587696.

55. Ahmad F. B., Cisewski J. A., Miniño A., Anderson R. N. Provisional Mortality Data — United States, 2020. MMWR Morbidity and Mortality Weekly Report. 2021. Vol. 70 (14). P. 519–522. doi: <https://doi.org/10.15585/mmwr.mm7014e1>. PMID: 33830988.

Надійшла до редакції 06.05.2024

Прийнята до опублікування 12.06.2024

Інформація про авторів (Information about the authors)

Mishchenko Maryna, Doctor of Philosophy, Kharkiv National Medical University. Assistant of the Department of Public Health and health care management; Kharkiv, Ukraine.

Міщенко Марина Михайлівна, докторка філософії, Харківський Національний медичний університет, асистент кафедри громадського здоров'я та управління охороною здоров'я; Харків, Україна.

E-mail: marihy83@gmail.com

<https://orcid.org/0000-0003-3423-9303> A, B, C, D, E, F

Ponomaryov Volodymyr, Doctor of Medical Sciences, Professor, Educational and Scientific Medical Institute of the National Technical University "Kharkiv Polytechnic Institute", Director of the Educational and Scientific Medical Institute of the National Technical University "Kharkiv Polytechnic Institute"; Kharkiv, Ukraine.

Пономарьов Володимир Іванович, доктор медичних наук, професор, Навчально-науковий медичний інститут Національного технічного університету «Харківський політехнічний інститут», директор Навчально-наукового медичного інституту Національного технічного університету «Харківський політехнічний інститут»; Харків, Україна.

E-mail: v.i.ponomariov@ukr.net

<http://orcid.org/0000-0003-2513-3187> D, E

Mishchenko Oleksandr, Candidate of Medical sciences, Associate Professor, Educational and Scientific Medical Institute of the National Technical University "Kharkiv Polytechnic Institute", Head of the Department of Organization and management of health care and social medicine; Kharkiv, Ukraine.

Мищенко Олександр Миколайович, кандидат медичних наук, доцент, Навчально-науковий медичний інститут Національного технічного університету «Харківський політехнічний інститут», завідувач кафедри організації та управління охороною здоров'я і соціальної медицини; Харків, Україна.

E-mail: alex_mischenko1976@ukr.net

<https://orcid.org/0000-0003-0043-2252> A, B, C, D, E, F

Voloshyna Svitlana, Educational and Scientific Medical Institute of the National Technical University "Kharkiv Polytechnic Institute", Assistant of the Department of Organization and management of health care and social medicine; Kharkiv, Ukraine.

Волошина Світлана Леонідівна, Навчально-науковий медичний інститут Національного технічного університету «Харківський політехнічний інститут», асистент кафедри організації та управління охороною здоров'я і соціальної медицини; Харків, Україна.

E-mail: voloshina.svetlana.1961@gmail.com

<https://orcid.org/0009-0008-4778-2755> D, E, F

-
- | | | |
|----------|---|---|
| A | – | Концепція та дизайн роботи (Work concept and design) |
| B | – | Збір та аналіз даних (Data collection and analysis) |
| C | – | Відповідальність за статистичний аналіз (Responsibility for statistical analysis) |
| D | – | Написання статті (Writing the article) |
| E | – | Критичний огляд статті (Critical review) |
| F | – | Остаточне затвердження статті (Final approval of the article) |
-

Відповідальний автор:

Мищенко Марина Михайлівна, докторка філософії, Харківський Національний медичний університет, асистент кафедри громадського здоров'я та управління охороною здоров'я».

✉ Україна, 61022, м. Харків, просп. Науки, 4.

E-mail: marihy83@gmail.com

Цитування: Mishchenko M., Ponomaryov V., Mishchenko O., Voloshyna S. Medical and social aspects of circulatory system diseases, cerebrovascular diseases and cerebral strokes. *Bulletin of medicine, Psychology and Pharmacy*. 2024. No. 2. P. 40–52. doi: <https://doi.org/10.20998/BMPP.2024.02.05>