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THE RATES OF MORTALITY FROM CIRCULATORY DISEASES IN THE WORKING-AGE POPULATION OF UKRAINE

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The authors of the paper aimed to determine the general trends and regional features of mortality of the working age population from diseases of the circulatory system in Ukraine in 2015-2019. It was found that in 2019, circulatory diseases caused every third (33.4 %) case of death of the working-age population in Ukraine. The probability of death from this pathology at working age in Ukraine is 2 times higher than the European mean and 4.6 times higher than in the European Union. The mortality rate of the rural population from diseases of the circulatory system is 19.5 % higher than in the urban population. Losses of the working-age population have a stable territorial profile and negative dynamics in most regions of Ukraine, which necessitates the adoption of targeted regional programs aimed at improving the prevention of circulatory diseases and the organization of cardiac and cardiological surgery.

Key words: circulatory diseases, mortality, working age population.

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СМЕРТНІСТЬ ВІД ХВОРОБ СИСТЕМИ КРОВООБІГУ НАСЕЛЕННЯ ПРАЦЕЗДАТНОГО ВІКУ УКРАЇНІ

Авторами статті було поставлено за мету визначити загальні тенденції та регіональні особливості смертності населення працездатного віку від хвороб системи кровообігу в Україні у 2015-2019 роках. Встановлено, що у 2019 р. хвороби системи кровообігу обумовили кожний третій (33,4 %) випадок смерті населення у працездатному віці в Україні. Ймовірність летального випадку від зазначеної патології у працездатному віці в Україні у 2 рази вища, ніж в середньому у Європі та у 4,6 разів вища, ніж у країнах Євросоюзу. Смертність сільського населення від хвороб системи кровообігу на 19,5 % вища, ніж міського. Втрати населення працездатного віку мають стабільний територіальний профіль та негативну динаміку у більшості областей України, що обумовлює необхідність прийняття цільових регіональних програм, спрямованих на удосконалення профілактики хвороб системи кровообігу та організації кардіологічної та кардіохірургічної допомоги.

Ключові слова: хвороби системи кровообігу, смертність, населення працездатного віку.

The study is a fragment of the research project "Medical and social substantiation for the medical care optimization in the development of the public health system", state registration No. 0120U100807.

Diseases of the circulatory system (DCS) are the main cause of death and disability of the adult and working age population (WAP) in Ukraine, which determines their significant medical, social and social-economic significance [2, 3, 6]. According to the State Statistics Service of Ukraine, almost 100 people of the working age die every day from DCS. DCS has for several decades continued to be the dominant cause of premature death in Ukraine, causing one in three cases, and the probability of dying from DCS at working age in Ukraine is several times higher than in Europe as a whole [4, 6, 10]. World experience shows that the current level of medical care can significantly reduce premature mortality from DCS [7, 9, 10].

The relevance of materials on population mortality as an information source for monitoring and assessing the Public Health and substantiation of medical and organizational levers for its preservation has increased sharply since 2018. This is due to the abolition of the form of statistical reporting, which accumulated statistics on the incidence and prevalence of DCS (Form No. 12 "Report on diseases registered in patients living in the area of medical and preventive institution") [4]. That is why today the definition of modern patterns of the WAP mortality from DCS and its regional features is an important scientific basis for the formation of regional policy to preserve and promote public health, as well as the definition of priority areas for improving the WAP's health care, the development of organizational forms and methods of health care institutions.

The purpose of the study was to determine the general trends and regional features of mortality from diseases of the circulatory system of the working age population in Ukraine in 2015–2019.

Materials and methods. The analysis of mortality of the working age population was carried out in dynamic (for 2015-2019) and territorial aspects on the basis of data from the State Statistics Service of Ukraine and the European database "European Health for All database" [8].

The working age limits when using the data "European Health for All database" were 25–65 years, according to the European standard. According to the State Statistics Service of Ukraine, mortality from DCS was analyzed in Ukraine as a whole and in some of its regions for the age group of 18–59 years inclusive.

The study identified and analyzed generally accepted intensive and extensive mortality rates from diseases of the circulatory system. The analysis was performed both in terms of the entire class of diseases of the circulatory system (I00–99) (according to the International Classification of Diseases, Tenth Revision), and in terms of coronary heart disease (I20–I25) and cerebrovascular diseases (I60–I69).

The population growth rate (in %) was used to analyze the dynamics of DCS mortality.

The analysis of territorial features of DCS mortality in Ukraine provided an assessment of the regional differentiation of WAP mortality from DCS according to the following parameters: minimum and maximum regional index values, amplitude (the difference between maximum and minimum value), coefficient of regional variation (CRV) – relative (in %) measure of variability of distribution of regional values – analog of coefficient of variation in variation statistics), the lower quartile (LQ) of the regional distribution series (the value of a variable in the region that divides a number of regional values into two parts so that a quarter (25 %) of survey units have values less than the LQ and the other part (75 %) have greater ones); the upper quartile (UQ) of the regional distribution series (the value of a variable in the region that divides a number of regional values into two parts, so that a quarter (25 %) of survey units have values greater than UQ and the other part (75 %) have less ones). In order to identify the most problematic areas for each cause of death, the spatial analysis identified regions that exceeded the upper quartiles of the regional distribution series in terms of mortality during the entire observation period in 2015–2019. The stability of the territorial patterns of WAP's mortality from DCS was assessed by the value of the correlation coefficient (Pearson's), calculated between regional indices in 2015 and 2019.

Results of the study and their discussion. The analysis of age-standardized mortality rates of the working age population (according to the European standard, 25–65 years) in Ukraine and other European countries showed that the mortality rate from DCS in WAP (2015) was almost by 2 times higher than the mean level in the WHO European Region and by 4.6 times higher than the figure in the European Union. The male mortality from DCS is particularly high in Ukraine. At the age of 25–65 years, men are by 2.5 times more likely to die from DCS than women in Ukraine and by 5 times higher than men in the European Union (fig. 1).

Diseases of the circulatory system for the second decade remain the leading cause of death in Ukraine, causing one in three deaths in working age (18-59 years inclusive). In 2019, the DCS share in the structure of WAP mortality was 33.4 %. Every 10th case of death from DCS is of working age population. In 2019, the mortality rate of DCS was 157.7 cases per 100 thousand of the population. Mortality of the rural population from DCS is by 19.5 % higher than urban (176.9 and 148.0 per 100 thousand of WAP, respectively). The problem of premature mortality from DCS, both in urban and rural areas, primarily affects the male population.

Analysis of the dynamics of WAP mortality from DCS in Ukraine showed that in five years its level increased by 10.9 % (from 142.2 in 2015 to 157.7 per 100 thousand of the population in 2019). Adverse dynamic trends were found both in rural areas, where the death rate per 100 thousand population increased from 174.7 to 176.9, and in urban areas – from 128.4 to 148.0, respectively.

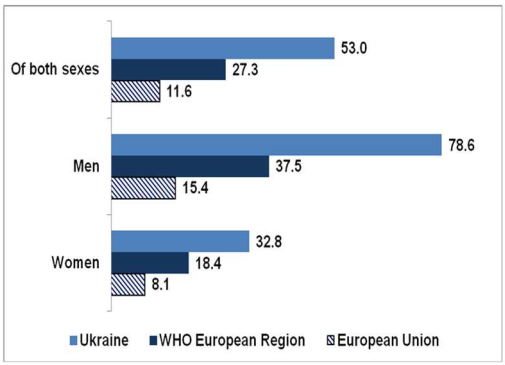

Fig. 1. Age-standardized mortality rates from DCS of the population aged 25-65 years in Ukraine, the WHO European region and the EU countries, 2015 (per 100 thousand of the relevant population)

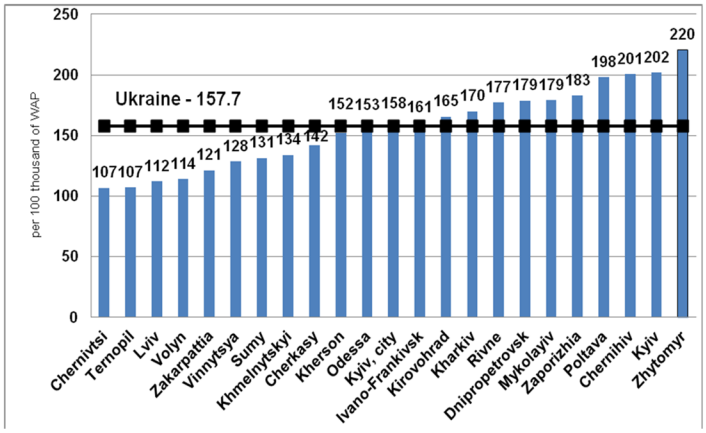

Fig. 2. Mortality rates from DCS of the working age population in 2019 in Ukraine and some regions (per 100 thousand of WAP)

When studying the regional features of WAP's mortality from DCS, a high degree of its regional variation was found (CRV consistently exceeded 21 %). In 2019, mortality rates from DCS in some regions differed more than by 2 times, ranging from the minimum – 106.6 (in Chernivtsi region), to the maximum – 220.4 (in Zhytomyr region) (fig. 2). In the course of the territorial analysis, areas with a stably unfavorable situation in terms of DCS mortality were identified. These include those that exceeded the upper quartile

of a number of regional indices in terms of WAP mortality during the entire follow-up period, namely: Zhytomyr, Kyiv, Chernihiv, Poltava, Zaporizhia and Mykolayiv regions (regions are listed in order of decreasing mortality). The lowest mortality rates, which never exceeded the lower quartile, were registered mainly in western Ukraine: Chernivtsi, Ternopil, Lviv, Volyn and Vinnytsia regions (regions are listed in the ascending order of mortality).

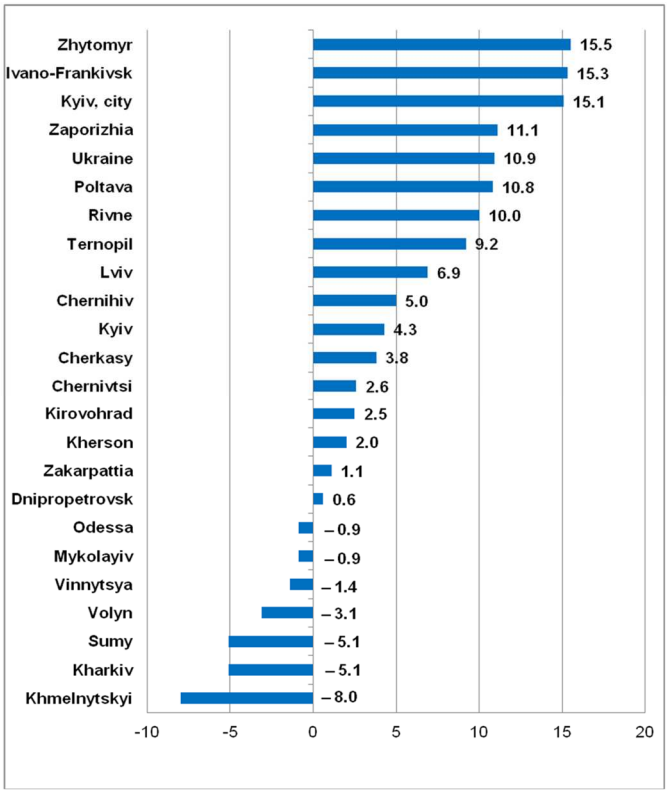

Fig. 3. Growth rates of mortality from DCS of the working age population in the regions of Ukraine (2019/2015, in %)

The stability of the identified spatial patterns of distribution of mortality rates from DCS in WAP is evidenced by the high value of the correlation coefficient between regional values of mortality rates in 2015 and 2019 ($r=0.95$, $p<0.05$).

The analysis of the dynamics of WAP mortality in 2019, compared to 2015, carried out in the regional aspect (fig. 3), showed that in the vast majority of regions of Ukraine the mortality rate from DCS has increased. Moreover, it increased the fastest in Zhytomyr region (by 15.5 %), Ivano-Frankivsk (by 15.3 %), Kyiv (by 15.1 %) Zhytomyr and Odessa regions. Decreases in the death rate from DCS were registered in Khmelnytskyi (–8.0 %), Kharkiv (–5.7 %), Sumy (–5.1 %) and Volyn (–3.1 %) regions.

The analysis of the causes of death in terms of nosological groups and forms of diseases is essential for determining priorities for the prevention of premature death. It should also be noted that its structure (in the absence of materials on the morbidity of the population) best accumulates all the pathology of the population.

The main causes of WAP death in the middle of the DCS class are coronary heart disease (CHD) and cerebrovascular disease (CVD), which share in the structure of WAP mortality in Ukraine in 2019 was 52.4 % and 17.3 %, respectively (fig. 4.).

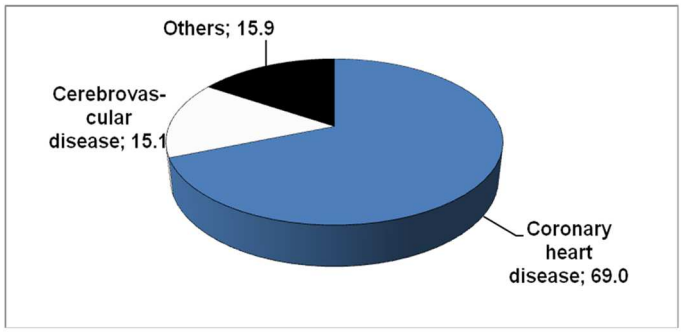

Fig. 4. The structure of mortality from DCS of the working-age population in Ukraine, 2019 (in %).

It should be noted that the dynamic trends and regional differences in the WAP's mortality from DCS were formed mainly due to CHD. CHD caused more than 50 % of all deaths from DCS in most regions, and its level increased in Ukraine by 5.4 % from 76.6 in 2015 to 80.7 per 100 thousand of WAP in 2019. During the entire follow-up period, CHD mortality was higher among rural residents than among urban residents (in 2019, 88.0 and 77.0 per 100 thousand of WAP, respectively).

Territorial analysis revealed a significant regional differentiation of CHD mortality rates with almost three times the ratio of maximum (in the Kyiv region) and minimum (in the Sumy region). The coefficient of regional variation in CHD mortality was 31 % (table 1).

Coronary heart disease mortality rates exceeded the upper quartile of the regional distribution in Kyiv region, Kyiv, Poltava, and Kirovohrad regions each year. A more favorable situation in terms of CHD mortality was consistently recorded in Sumy, Zakarpattia, Lviv, Khmelnytskyi, Ternopil, and Volyn regions. The stability of the spatial distribution of WAP mortality rates from CHD confirms the high value of the correlation coefficient between territorial indices in 2015 and 2019 ($r=0.96$, $p<0.05$).

Dynamic analysis showed the most unfavorable changes in the mortality rates from coronary heart disease among WAP in Kyiv (+15.9 %), Kherson (+15.6 %), Poltava (+12.2%), Ivano-Frankivsk (+11.6 %) regions. The most significant decrease in mortality rates occurred in Kharkiv (–15.5%), Odesa (–13.3%), Sumy (–12.3%) and Lviv (–10.7%) regions.

Table 1.

Mortality of the working age population from DCS in Ukraine and its regions in 2015, 2019 (per 100 thousand of the relevant population)

Territory	All DCS			CHD			CVD		
	2015	2019	GR*	2015	2019	GR	2015	2019	GR
Ukraine	**142.2**	**157.7**	**10.9**	**76.6**	**80.7**	**5.4**	**28.0**	**26.6**	**–5.0**
Vinnytsia	130.1	128.3	–1.4	74.4	68.6	–7.8	23.7	23.5	–0.8
Volyn	117.3	113.7	–3.1	62.1	59.1	–4.8	25.2	20.0	–20.6
Dnipropetrovsk	177.7	178.8	0.6	91.6	92.4	0.9	31.9	30.1	–5.6
Zhytomyr	190.8	220.4	15.5	57.9	60.2	4.0	29.8	27.1	–9.1
Zakarpattia	119.9	121.2	1.1	54.3	50.2	–7.6	21.1	20.7	–1.9
Zaporizhzhya	164.4	182.7	11.1	78.6	84.6	7.6	35.1	31.4	–10.5
Ivano-Frankivsk	139.2	160.5	15.3	70.6	78.8	11.6	20.2	19.6	–3.0
Kyiv	193.5	201.8	4.3	132.5	139.3	5.1	31.0	30.4	–1.9
Kirovohrad	161.3	165.4	2.5	103.2	109.5	6.1	34.8	31.8	–8.6
Lviv	104.6	111.8	6.9	56.9	50.8	–10.7	23.9	22.3	–6.7
Mykolayiv	180.7	179.1	–0.9	82.3	78.9	–4.1	29.5	27.9	–5.4
Odessa	154.5	153.1	–0.9	68.2	59.2	–13.2	34.2	29.2	–14.6
Poltava	178.5	197.8	10.8	102.4	114.9	12.2	33.6	31.2	–7.1
Rivne	161.2	177.3	10.0	80.8	83.2	3.0	26.3	25.8	–1.9
Sumy	138.3	131.3	–5.1	56.9	49.9	–12.3	34.3	31.9	–7.0
Ternopil	97.9	106.9	9.2	53.2	55.4	4.1	17.1	18.5	8.2
Kharkiv	180.2	169.9	–5.7	84.6	71.5	–15.5	35.3	29.0	–17.8
Kherson	148.9	151.9	2.0	75.4	87.2	15.6	43.0	37.7	–12.3
Khmelnytskyi	145.4	133.8	–8.0	58.4	55.3	–5.3	28.5	23.6	–17.2
Cherkasy	136.9	142.1	3.8	63.9	69.0	8.0	30.0	28.4	–5.3
Chernivtsi	103.9	106.6	2.6	77.3	78.6	1.7	14.5	15.7	8.3
Chernihiv	190.9	200.5	5.0	104.6	107.1	2.4	41.8	33.6	–19.6
Kyiv	136.8	157.5	15.1	102.8	119.1	15.9	23.2	21.4	–7.8
Statistical parameters:									
Minimum	97.9	106.6		53.2	49.9		14.5	15.7	
Lower quartile	136.8	129.8		62.1	59.2		23.9	21.9	
Median	154.5	157.5		77.3	78.6		30.0	27.9	
Upper quartile	180.2	179.0		102.4	89.8		34.8	30.8	
Maximum	216.3	220.4		149.5	139.3		52.8	37.7	
Amplitude	118.4	113.8		96.3	89.4		38.3	22.0	
CRV	21.6	21.3		31.6	31.3		29.7	21.1	

Notes: *GR – growth rate in 2019/2015 (in %)

Cerebrovascular diseases remain the second leading cause of death in the middle of DCS class, accounting for 17.3% of all deaths from DCS among WAP. Thanks to the implementation of the National Program for the Prevention and Treatment of Hypertension in Ukraine, it has been possible to reduce mortality from CHD. During 2015-2019, mortality rates from this cause among WAP decreased in Ukraine by 5 % (from 28.0 to 26.6 per 100 thousand of the population). The downward dynamics of mortality from CVD took place in both urban and rural areas. The tendency to exceed the mortality rates from CVD among rural residents remained stable over time (compared to urban residents (28.6 and 25.6 per 100 thousand of WAP, respectively, in 2019).

Territorial analysis showed that throughout the observation period, mortality rates from CVD exceeded the upper quartile of the regional distribution series in Kherson, Chernihiv and Zaporizhia regions. The lower quartiles did not exceed the indices in Chernivtsi, Ternopil, Ivano-Frankivsk and Zakarpattia regions. The stability of the spatial profile of WAP mortality rates from CVD confirms the high value of the correlation coefficient between territorial indices in 2015 and 2019 ($r=0.96$, $p<0.05$).

During 2015–2019, mortality from CVD decreased in almost all territories. It decreased the fastest in Kyiv (–19.9 %), Khmelnytskyi (–17.1 %), Odessa (–14.5 %) and Kherson (–12.2 %) regions. The exceptions were Ternopil and Chernivtsi regions, where an increase in mortality from CVD in working age was registered.

Thus, the mortality of WAP from DCS in Ukraine is characterized by a very high level (compared to European countries), a tendency to increase, as well as stable territorial features. The highest mortality rates from DCS in working age population are registered in Zhytomyr, Kyiv, Chernihiv, Poltava, Zaporizhia and Mykolayiv regions. Similar regional features of the loss of years of potential life due to DCS were found in the studies of Ryngach N.O. [5].

The dynamics and territorial differences of WAP mortality from DCS are formed mainly due to coronary heart disease, which in most areas accounts for more than 50 % of all deaths from DCS. CHD refers to those causes of premature mortality, which, according to modern international experience, can be prevented (avoidable mortality) [7]. The results of our research indicate the need for targeted territorial programs aimed at overcoming premature mortality from coronary heart disease, which is largely manageable and the losses from which can be significantly reduced, provided that an effective prevention system [9, 10].

Higher levels of WAP mortality from DCS among the rural population, found in both our and other studies [3, 6], are a consequence of insufficient access to health care for rural residents and necessitate improved organization of cardiac and cardiological care, primarily for this population group.

The set of measures aimed at reducing the premature mortality of WAP from DCS by improving the organization of medical care should include: prevention, timely detection and accounting of diseases of the circulatory system; providing conditions for effective treatment of circulatory system diseases (improvement of cardiac service infrastructure, improvement of its material and technical base, construction of cardiac surgery centers, introduction of telemedicine technologies, full-fledged medical supply), as well as medical examination of patients with circulatory system diseases; training of highly qualified medical personnel for cardiological and cardiosurgical subdivisions, advanced training of first-level doctors on prevention, diagnosis, treatment and rehabilitation of patients with diseases of the circulatory system; quality control of medical care for patients with diseases of the circulatory system, which was provided at all stages of diagnosis and treatment [1, 3].

Conclusion

In Ukraine, diseases of the circulatory system are the leading cause of death in the working age population and account for every third case (33.4 % in 2019).

The WAP mortality rate from DCS in Ukraine is 2 times higher than in the European region and tends to increase (during 2015–2019 it increased by 10 % from 142.2 to 157.7 per 100 thousand of the population).

Losses of the working-age population have a stable territorial profile and negative dynamics in most regions of Ukraine, which necessitates the adoption of targeted regional programs aimed at improving the prevention of circulatory diseases and the organization of cardiac and cardiological surgery.

The problem of increasing the availability of cardiac and cardiological surgery care for rural residents, among whom the mortality rate from diseases of the circulatory system in working age is 19.5 % higher than among urban residents, needs to be urgently addressed.

Prospects for further research are to use the results to substantiate conceptual approaches to improving the prevention and organization of medical care for patients with DCS at the regional level.

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