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ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

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METABOLIC SYNDROME AND CEREBRAL STROKE
IN KAZAKHSTAN: SOME MANAGEMENT FACTORS

Abstract. The purpose of the paper is to study the specific features of the influence of certain factors on mortality due to cerebral stroke (CS) in different regions of Kazakhstan.

Materials and methods. The data on incidence and mortality in CS from the national statistics of Kazakhstan were used. The analysis was carried out using the methods of descriptive and analytical statistics.

Results. Three groups of regions of Kazakhstan have been formed depending on the level of the specific gravity of the CS in the overall structure of deaths for 2012-2016. The ratio of incidence to mortality in Kazakhstan indicated stable dynamics from 2012 to 2016 among the population. The data obtained suggest that among the generally accepted medical and non-medical measures, the management of the development of metabolic disorders before the risks of aging-associated diseases can be used to manage their mortality, including from a cerebral stroke.

Keywords: cerebral stroke, metabolic syndrome, incidence, mortality.

Introduction. In Kazakhstan, the problem of cerebral stroke (CS) is the most important problem in the structure of the causes of CS deaths and ranks second after coronary heart disease, which corresponds to the structure of the leading causes of death in the world [1-5]. However, in the country, the rate of mortality growth in CS, against the backdrop of an increase in life expectancy and an increase in the proportion of people over 65, significantly outstrips the rate of death in acute myocardial infarction. Therefore, in the coming years Kazakhstan may well be among the countries where CS is the first cause among other causes of deaths of the population.

Such dynamics is confirmed by the conclusions obtained by Feigin V.L. with co-authors within the framework of the systematic review "Global and regional burden of stroke during 1990-2000" [6].

The Republic of Kazakhstan is located in Central Asia, it includes 14 regions and 2 cities of republican significance, differing significantly in the density of residence (from 2.7 to 23.5 sq.km.), the proportion of people over 65 (from 3, 74% to 10.68%) and, accordingly, the main indicators of incidence and mortality. The specific gravity of CS deaths also has significant differences in different regions of the country (from 3.2% in the West Kazakhstan in 2012 to 12.8% in the Karaganda in 2016).

Purpose of the study. To study the specific features of the influence of certain factors on mortality due to cerebral stroke in different regions of Kazakhstan.

Materials and methods. The study was conducted in the following stages:

1. A retrospective study of cases of CS among population of 16 regions of the country and cities of Astana and Almaty was carried out based on the data of statistical reports of the Ministry of Health and the Agency for Statistics of the Republic of Kazakhstan for 2012-2016 [3, 4].

2. The CS situation was assessed based on the data of the electronic health records of patients treated in the country's hospitals [3, 4].

3. A retrospective analysis of the effectiveness of CS prevention at the level of correction of metabolic disorders was made based on the data of the Medical Center Hospital of President's Affairs Administration of the Republic of Kazakhstan.

We used software tools VBA Microsoft Excel and a package of statistical programs Statistica 9.0. for statistical data analysis. Standardized indicators were calculated taking into account the age-sex pattern of the population of the Republic of Kazakhstan. The method of direct standardization was applied. Data on the distribution of the number of men and women by age groups in Kazakhstan were used. Fisher's exact test was used to determine the reliability of the differences in the obtained indicators. The critical level of significance in testing hypotheses was $p = 0.05$.

Results. The regions of Kazakhstan were divided into 3 groups according to the level of specific gravity of CS in the overall structure of deaths for 2012-2016.

The first group (high-level) included the regions (4 regions) of the country, where the indicator is higher than the average republican range (10.68% and higher): Karaganda (12.88%), South Kazakhstan (10.94%), Aktobe (10.77%), Atyrau (10.69%) regions. In these regions, 32.1% of Kazakhstan's population (5,655.0 people) live, and 38% (4,368 cases) of the population died of the total number of deaths from stroke in Kazakhstan (11,510 cases) in 2012-2016.

The second group (mid-level) included the regions (3 regions and 1 city) of the country, where the indicator is close to the average republican range (from 8.73% to 10.67%): Astana (9.63%) city, Zhambyl (10.45%), Kyzylorda (9.60%), West Kazakhstan (9.38%) regions. In these regions, 19.1% of Kazakhstan's population (3,385.3 people) live, and 18.4% (2,117 cases) of the population died of the total number of deaths from stroke in Kazakhstan (11,510 cases) in 2012-2016.

The third group (low-level) included the regions (7 regions and 1 city) of the country, where the indicator is below the average republican range (8.72 and below): Almaty (8.36%) city, Pavlodar (8.05%), North Kazakhstan (7.22%), Mangystau (7.07%), East Kazakhstan (6.94%), Almatynskaya (6.78%), Akmola (6.30%), Kostanai (5.17%) regions. In these regions, 48.8% of the population of Kazakhstan (8,629.5 people) live and 43.6% (5,025 cases) of the population died of the total number of deaths from stroke in Kazakhstan (11,510 cases) in 2012-2016.

A number of indicators were evaluated, reflecting the impact of medical and non-medical factors on the specific gravity of CS in the total number of deaths in 2012-2016. The most significant factors were formulated as follows:

– non-medical factors: density of residence, the ratio of unemployed and employed people among hospital cases, the ratio of women and men among hospital cases, the proportion of people over 65, total 4 indicators;

– medical factors: incidence to mortality rate of CS, specific gravity of hospital mortality of CS, case fatality rate of CS, number of concomitant diseases per 1 inpatient case with CS, total 4 indicators. The evaluation of each factor was carried out both during the period under study and through the indicator averaged for the period under study.

Non-medical factors. The proportion of unemployed people among hospital cases indicated a direct effect on the proportion of deaths from stroke in the structure of causes of death in the regions of Kazakhstan, prevailing in the regions with a high specific gravity of deaths from strokes (7.39) over regions with a low specific gravity of deaths from stroke (1.89) 3.9 times (table 1).

Table 1 – Non-medical factors in the main study groups (2012-2016)

Indicators	The first group (high-level)	The second group (mid-level)	The third group (low-level)
Density of residence, sq.km.	8,8	5,1	5,5
The ratio of unemployed and employed people among hospital cases	7,39	5,75	1,89
The ratio of women and men	0,978	0,977	1,02
The proportion of people over 65, %	5,83	5,61	8,3

Source: Statistical compilation of the Ministry of Health of the Republic of Kazakhstan "Health of the Population of the Republic of Kazakhstan and the Activities of Health Organizations in 2012-2017", "Demographic Yearbook of Kazakhstan in 2017", Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

In the indicators common to the group of regions there is no noticeable influence of the ratio of women and men, the proportion of the old population on the proportion of deaths from CS. However, after a parallel assessment of the dynamics of these indicators in the period under study, it became apparent that the ratio of women to men is 1:1, in the regions of the third group where the proportion of the population over 65 is higher than the national average. Conversely, the ratio of women to men is 1:1, in the regions of the first and the second group where the proportion of the population over 65 is below the national average. Thus, in the context of the significant difference between the life expectancy of women (76.61 years) and men (67.99 years), the influence of the predominant increase in the number of deaths from stroke among women over 65 is increasing in Kazakhstan.

Non-medical factors should be taken into account when developing integrated approaches to the model of management of incidence and mortality of CS: employment of the population, especially the able-bodied, with the aim of self-sufficiency with the necessary resources for a quality life, the development of transport and social infrastructure in the regions with a low population density. In addition, such work is conducting in Kazakhstan within the framework of state programs [1, 2].

Medical factors. In the regions of the group with a high level of death of CS (the first group), patients are more likely to receive inpatient medical care, although at the same time in-hospital case fatality rate increases to some extent. In addition, comorbidities are more often recorded. This situation makes it possible to evaluate emergency medical assistance in case of CS as more organized.

The average specific grafity of deaths in CS was accompanied by an even higher incidence in the regions of the group with mid mortality level in CS (the second group), but in this group, patients die less in hospital than in others, and the number of concomitant diseases for hospital stroke is below the average by country (table 2). For this group of regions, the organization of emergency medical assistance was evaluated as less organized.

Table 2 – Medical factors in the main study groups (2012-2016)

Indicators	The first group (high-level)	The second group (mid-level)	The third group (low-level)
Incidence to mortality rate of CS	2,93	6,53	4,71
Specific gravity of hospital mortality of CS	45	44	57,0
Case fatality rate of CS	10,8	9	9,2
Number of concomitant diseases per 1 inpatient case with CS	0,55	0,41	0,53
Source: Statistical compilation of the Ministry of Health of the Republic of Kazakhstan "Health of the Population of the Republic of Kazakhstan and the Activities of Health Organizations in 2012-2017", "Demographic Yearbook of Kazakhstan in 2017", Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.			

Thus, medical factors can also be used to manage mortality from strokes: from standard counseling at the prehospital level to timely inpatient care, since they have a direct effect on the specific gravity of CS in the overall structure of deaths. Within the framework of the State Health Development Program "Densaulyk" for 2016-2019, the management of strokes, as well as the management of the four most significant non-communicable diseases related to age, is built based on an integrated model of medical care (cluster).

However, these activities involve the provision of medical care to patients who already have cerebrovascular disease. In this regard, it is appropriate to present some results of the work on the prevention of strokes at the level of correction of metabolic disorders. This work is carried out at the Medical

Table 3 – Basic data on the group of patients of the MCH PAA RK

Indicators	2012	2013	2014	2015	2016
The proportion of people over 65, %	4,4	4,4	5,5	6,4	7,4
The ratio of women and men	1,3	1,3	1,2	1,3	1,27
The incidence of stroke, 100 thousand people	75,7	56,2	73,5	65,3	98,9
Mortality from strokes, 100 thousand people	8,4	32,1	14,7	13,1	11,6
Incidence to mortality rate of CS	9,0	2,4	5,0	4,98	8,52
Source: Statistical reports of the MCH PAA RK for 2012-2016.					

Center Hospital of President's Affairs Administration of the Republic of Kazakhstan (MCH PAA RK) for 5 years with a group of 19,328 patients. The incidence, mortality, and the ratio of these indicators show stable dynamics from 2013, unlike similar indicators for Kazakhstan (table 3).

The data obtained suggest that among the generally recognized medical and non-medical measures, the management of the development of metabolic disorders prior to the implementation of risks can be used to manage the risks associated with mortality, including from CS.

Conclusions. Clinical and demographic data for Kazakhstan indicate an increase in the frequency of CS in relation to myocardial infarction, which is a serious challenge for the health care system and social protection of Kazakhstan and the need for their readiness for the growth of disability among the increasing proportion of the population of the elderly and senile age.

Given the continuing increase in incidence and mortality of CS with a stable ratio against the background of objective improvement of medical care for patients with cerebrovascular diseases in Kazakhstan, it is necessary to recognize the insufficient effectiveness of today's measures.

Kazakhstan needs a comprehensive and comparable assessment of incidence, prevalence, mortality, disability and epidemiological trends of diseases associated with age, which would allow defining an effective strategy for management of functional aging, which determines the development of anti-aging medicine.

It became obvious that the prevention of high risk of stroke at the level of previous metabolic disorders can be much more effective than the detection and treatment of already realized diseases. This is evidenced by a significant decrease in incidence and mortality of CS in the group of patients under preventive supervision for metabolic syndrome, against the backdrop of the continued growth of these indicators in Kazakhstan.

Thus, a population strategy focused on the prevention of the risk of aging-associated diseases will allow move their incidence and mortality to a later age, and therefore significantly increase the period of active longevity.

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**ҚАЗАҚСТАНДАҒЫ МЕТАБОЛИКАЛЫҚ СИНДРОМ ЖӘНЕ ЦЕРЕБРАЛЬДЫ ИНСУЛЬТ:
КЕЙБІР БАСҚАРУ ФАКТОРЛАРЫ**

Аннотация. Зерттеудің мақсаты Қазақстан аймақтарында церебральді инсульттың (ЦИ) салдарынан болған өлімге кейбір факторлардың әсерінің ерекшеліктерін зерттеу болып табылады.

Материалдар және әдістер. ЦИ кезінде ауру және өлім-жітім туралы Қазақстанның мемлекеттік статистикасының мәліметтері пайдаланылды. Талдау статистикалық және аналитикалық статистиканы қолдана отырып жүргізілді.

Нәтижелер. 2012-2016 жылдардағы өлім-жітімнің жалпы құрылымында ЦИ үлесінің деңгейіне байланысты Қазақстан аймақтарының үш тобы құрылды. Осы топтағы аурудың өлім-жітімге қатынасы 2012-2016 жылдар аралығында Қазақстан халқының арасында тұрақты динамикаға ие болды. Алынған мәліметтер жалпы қабылданған медициналық және медициналық емес шаралардың ішінде метаболикалық бұзылулардың дамуын басқару жас-ассоциацияланған аурулар қауіптерін іске асыруға дейін олардың өлім-жітімін, оның ішінде церебральды инсульттан болған өлімді басқару үшін пайдаланылуы мүмкін екендігін көрсетеді.

Түйін сөздер: церебральді инсульт, метаболикалық синдром, ауру-сырқау, өлім-жітім.

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МЕТАБОЛИЧЕСКИЙ СИНДРОМ И МОЗГОВОЙ ИНСУЛЬТ В КАЗАХСТАНЕ: НЕКОТОРЫЕ ФАКТОРЫ УПРАВЛЕНИЯ

Аннотация. Целью исследования было изучение особенностей влияния некоторых факторов на смертность по причине мозгового инсульта (МИ) в разных регионах Казахстана.

Материалы и методы. Использованы данные о заболеваемости и смертности при МИ официальной государственной статистики Казахстана. Анализ проводился с использованием методов описательной и аналитической статистики.

Результаты. Сформированы 3 группы регионов Казахстана в зависимости от уровня удельного веса МИ в общей структуре смертей за период 2012-2016 годы. Соотношение заболеваемости к смертности в этой группе имело стабильную динамику с 2012 года по 2016 году среди населения Казахстана. Полученные данные позволяют предполагать, что в числе общепризнанных медицинских и немедицинских мероприятий управление развитием метаболических нарушений до реализации рисков возраст ассоциированных заболеваний может быть использовано в управлении их смертностью, в т.ч. и от мозгового инсульта.

Ключевые слова: метаболический синдром, долголетие, антивозрастная медицина, мозговой инсульт, заболеваемость, смертность, летальность.

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