TRENDS IN INCIDENCE AND MORTALITY FROM DISEASES INCLUDED IN DISEASE MANAGEMENT PROGRAMS: DIABETES MELLITUS, ARTERIAL HYPERTENSION, CHRONIC HEART FAILURE

Oryngul Jumagazieva[1], https://orcid.org/0000-0003-1914-7179

Ainur B. Qumar[1], https://orcid.org/0000-0003-0457-7205

Kamila Faizullina[1], https://orcid.org/0000-0002-2031-9444

Nazgul Akhtayeva[1], https://orcid.org/0000-0002-0835-9814

Anuar D. Akhmetzhan[1], https://orcid.org/0009-0009-7451-9706

Merekesh Brimzhanova[2], https://orcid.org/0009-0008-9269-8982

Venera Baurzhan[3]

[1] **Asfendiyarov Kazakh National Medical University, Almaty, Republic of Kazakhstan;**
[2] **Hospital of the Medical Center of the Presidential Administration of the Republic of Kazakhstan, Almaty, Republic of Kazakhstan;**
[3] **Almaty City Rheumatology Center, Almaty, Republic of Kazakhstan.**

Abstract

Introduction. The number of non-communicable diseases (NCDs) is increasing worldwide, mainly cardiovascular diseases and diabetes mellitus. In Kazakhstan, disease management programs (DMP) for three nosologies have been introduced to reduce the risk of NCDs.

Aim: To study incidence and mortality rates trends from three nosologies included in DMP: diabetes mellitus (DM), chronic heart failure (CHF) and arterial hypertension in Almaty city.

Materials and methods. The data were obtained from the National Scientific Center for Health Development in Almaty. For the incidence analysis, data were obtained from 2016 to 2023, since the PHI was implemented during this period, while for mortality, data were obtained from 2013 to 2023. To predict the number of incidence and mortality for three types of nosologies, the linear regression method

Results. The incidence per 100,000 population for all three nosologies is growing in all age groups: DM from 2230.5 to 3621.3, for hypertension from 6596.9 to 11811.3 and for CHF from 321.8 to 1432.9. An increase in mortality from diabetes mellitus was observed from 2.85 to 22.34, and a further increase to 42.48 per 100.000 population is expected. Similarly, an increase in hypertension was observed from 2.17 to 12.67 from 2013 to 2023, and its growth to 20.58 is expected by 2028. A decrease in CHF was observed from 20.21 to 9.20 by 2023, and a further reduction to 1.24 by 2028 is expected.

Conclusion. Our analysis shows an increase in the incidence of all three nosologies, in particular, diabetes and CHF at a young age, while hypertension and CHF in the age group of 60-74 years. Positive dynamics is the improvement in the coverage of patients involved in the PHC, but there has been a decrease in the proportion of patients in all three nosologies in the last two years

Keywords: diabetes mellitus, adult population, trends, forecast, health policy.

Резюме

ТЕНДЕНЦИИ ЗАБОЛЕВАЕМОСТИ И СМЕРТНОСТИ ОТ БОЛЕЗНЕЙ, ВКЛЮЧЕННЫХ В ПРОГРАММЫ УПРАВЛЕНИЯ ЗАБОЛЕВАНИЯМИ: САХАРНЫЙ ДИАБЕТ, АРТЕРИАЛЬНАЯ ГИПЕРТЕНЗИЯ, ХРОНИЧЕСКАЯ СЕРДЕЧНАЯ НЕДОСТАТОЧНОСТЬ

Орынгул Джумагазиева[1], https://orcid.org/0000-0003-1914-7179

Айнур Кумар[1], https://orcid.org/0000-0003-0457-7205

Камила Файзуллина[1], https://orcid.org/0000-0002-2031-9444

Назгуль Ахтаева[1], https://orcid.org/0000-0002-0835-9814

Ануар Д. Ахметжан[1], https://orcid.org/0009-0009-7451-9706

Мерекеш Бримжанова[2], https://orcid.org/0009-0008-9269-8982

Венера Бауржан[3]

[1] **Казахский Национальный Медицинский Университет имени С.Д. Асфендиярова, г. Алматы, Республика Казахстан;**

²Больница Медицинского центра Управления делами Президента Республики Казахстан Алматы, Республика Казахстан;
³Городской ревматологический центр, г. Алматы, Республика Казахстан.

Введение. В мире наблюдается рост неинфекционных заболеваний (НИЗ), в основном сердечно-сосудистых, сахарного диабета и других. В Казахстане для снижения риска НИЗ внедрены программы управления заболеваниями (ПУЗ) по трем нозологиям.

Цель: изучить тенденции заболеваемости и смертности от трех нозологий, включенных в ПУЗ: сахарного диабета (СД), хронической сердечной недостаточности (ХСН) и артериальной гипертензии в г. Алматы.

Материалы и методы. Данные были получены из Национального научного центра развития здравоохранения г. Алматы. Для анализа заболеваемости были получены данные за период с 2016 по 2023 годы, так как в этот период была внедрена ФОМС, а для анализа смертности были получены данные за период с 2013 по 2023 год. Для прогнозирования заболеваемости и смертности по трем типам нозологий использовали метод линейной регрессии.

Результаты исследования. Заболеваемость на 100 тыс. населения по всем трем нозологиям растет во всех возрастных группах: СД с 2230,5 до 3621,3, гипертонии с 6596,9 до 11811,3 и ИБС с 321,8 до 1432,9. Наблюдалось увеличение смертности от сахарного диабета с 2,85 до 22,34, и ожидается дальнейшее увеличение до 42,48 на 100 тыс. населения. Аналогичным образом, с 2013 по 2023 год наблюдалось увеличение смертности от гипертонии с 2,17 до 12,67, а к 2028 году ожидается ее увеличение до 20,58. Снижение заболеваемости ИБС наблюдалось с 20,21 до 9,20 к 2023 году, и ожидается дальнейшее снижение до 1,24 к 2028 году.

Выводы. Наш анализ показывает рост заболеваемости по всем трем нозологиям, в частности, диабетом и ИБС в молодом возрасте, а гипертонией и ИБС в возрастной группе 60-74 года. Положительной динамикой является улучшение охвата пациентов ПМСП, однако за последние два года отмечается снижение доли пациентов по всем трем нозологиям

Ключевые слова: сахарный диабет, взрослое население, тенденции, прогноз, политика здравоохранения.

Түйіндеме

АУРУЛАРДЫ БАСҚАРУ БАҒДАРЛАМАЛАРЫНА ЕНГІЗІЛГЕН АУРУЛАРДЫҢ ЖИІЛІГІ МЕН ӨЛІМ-ЖІТІМ ТЕНДЕНЦИЯЛАРЫ: ҚАНТ ДИАБЕТІ, АРТЕРИЯЛЫҚ ГИПЕРТЕНЗИЯ, СОЗЫЛМАЛЫ ЖҮРЕК ЖЕТКІЛІКСІЗДІГІ

Орынгул Джумагазиева¹, https://orcid.org/0000-0003-1914-7179

Айнур Кумар¹, https://orcid.org/0000-0003-0457-7205

Камила Файзуллина¹, https://orcid.org/0000-0002-2031-9444

Назгуль Ахтаева¹, https://orcid.org/0000-0002-0835-9814

Ануар Д. Ахметжан¹, https://orcid.org/0009-0009-7451-9706

Мерекеш Бримжанова², https://orcid.org/0009-0008-9269-8982

Венера Бауржан³

¹С.Ж. Асфендияров атындағы Қазақ Ұлттық Медицина Университеті, Алматы қ., Қазақстан Республикасы;
²Қазақстан Республикасы Президентінің Іс басқармасы Медициналық орталығының ауруханасы Алматы қ., Қазақстан Республикасы;
³Алматы қ. Қалалық ревматологиялық орталық, Алматы қ., Қазақстан Республикасы.

Кіріспе. Әлемде жұқпалы емес аурулардың (ЖЕА), негізінен жүрек-қан тамырлары ауруларының, қант диабетінің және басқалардың өсуі байқалады. Қазақстанда ЖЕА тәуекелін төмендету үшін үш нозология бойынша ауруларды басқару (АББ) бағдарламалары енгізілді.

Мақсаты: Алматы қаласындағы үш нозологиядан: қант диабеті (ҚД), созылмалы жүрек жеткіліксіздігі (СЖЖ) және артериялық гипертензиядан болатын сырқаттанушылық пен өлім-жітім үрдістерін зерделеу.

Материалдар мен әдістер. Деректер Алматы қаласындағы денсаулық сақтауды дамытудың Ұлттық ғылыми орталығынан алынды. Сырқаттанушылықты талдау үшін 2016 жылдан 2023 жылға дейінгі кезеңдегі деректер алынды, өйткені осы кезеңде ММСФ енгізілді, ал өлім-жітімді талдау үшін 2013 жылдан 2023 жылға дейінгі кезеңдегі деректер алынды. Нозологияның үш түрі бойынша ауру мен өлімді болжау үшін сызықтық регрессия әдісі қолданылды.

Зерттеу нәтижелері. Барлық үш нозология бойынша 100 мың тұрғынға шаққандағы сырқаттанушылық барлық жас топтарында өсуде: ҚД 2230,5-тен 3621,3-ке дейін, гипертония 6596,9-дан 11811,3-ке дейін және ЖИА 321,8-ден 1432,9-ға дейін. Қант диабетінен болатын өлім-жітімнің 2,85-тен 22,34-ке дейін өсуі байқалды және одан әрі 100 мың тұрғынға шаққанда 42,48-ге дейін ұлғаю күтілуде. Сол сияқты, 2013 жылдан 2023 жылға дейін гипертониядан болатын өлім-жітім 2,17-ден 12,67-ге дейін өсті, ал 2028 жылға қарай 20,58-ге дейін өседі деп

күтілуде. ЖИА ауруының төмендеуі 2023 жылға қарай 20,21-ден 9,20-ға дейін байқалды және 2028 жылға қарай 1,24-ке дейін төмендейді деп күтілуде.

Қорытынды. Біздің талдауымыз барлық үш нозологияда, атап айтқанда, жас кезінде қант диабеті мен ЖИА, ал 60-74 жас тобында гипертония мен ЖИА жиілігінің өсуін көрсетеді. МСАК пациенттерін қамтудың жақсаруы оң динамика болып табылады, алайда соңғы екі жылда барлық үш нозология бойынша пациенттер үлесінің төмендеуі байқалады.

Түйінді сөздер: қант диабеті, ересектер, тенденциялар, болжам, денсаулық сақтау саясаты.

Introduction

Chronic non-communicable diseases are public health problems worldwide. Most people with non-communicable diseases (NCD) live low-and middle-income countries. 47% of deaths are due to NCDs, with heart disease, stroke and diabetes being the leading causes [13].

According to the World Health Organization, diabetes increased from 108 to 422 million cases between 1980 and 2014, while other authors attribute 4.2 million deaths among adults aged 20 to 79 years to diabetes [7]. According to the International Diabetes Federation, diabetes accounts for 11.3% of deaths worldwide, with the lowest in the African region (6.8%) and the highest in the Middle East and North Africa (16.2%). Diabetes-related mortality was most common among people aged 60 years (46.2%) in the African Region (73.1%) and the lowest in the European Region (31.4%) [14]. In another study, the global age-standardized overall prevalence of diabetes was 6.1%, and the projection showed a likely increase above 10.0% by 2050. High body mass index is the leading cause of disease burden from diabetes, which has increased by 24.3% globally from 1990 to 2021 [5].

The leading cause of premature mortality from cardiovascular disease is hypertension [11]. An increase in hypertension was found from 1990 to 2019 in both men (from 317 to 652) and women (from 331 to 626). However, the most significant progress in treatment and diagnosis was found in high-income countries in Central Europe, as well as in several upper-middle-income and, more recently, high-income countries, including Costa Rica, Taiwan, Kazakhstan, South Africa, Brazil, Chile, Turkey, and Iran [12]. Complications of heart disease, such as chronic heart failure, affect more than 64 million people worldwide, and there has been limited research on this disease [15].

Similar to other countries in the world, in Kazakhstan, there is an increase in diabetes and hypertension [2,19]. The rise in diabetes was revealed in studies conducted in Kazakhstan, where, for example, an increase in the prevalence of type 1 and type 2 diabetes by 1.7 times and mortality by 4 and 6 times was found from 2014 to 2019 [6]. Another study from 2018 to 2021 revealed an increase in diabetes incidence by 1.9 times (from 207.2 to 392.3) and mortality by 1.5 times (from 22.3 to 34.1) per 100.000 population.

The development of primary health care in Kazakhstan is a priority for the health care system, as is ensuring universal health coverage. Since 2013, the implementation of disease management programs for diabetes mellitus, chronic heart failure and hypertension has been launched in order to reduce mortality and improve public awareness of risk factors and prevent complications from these diseases. Despite the introduction of disease management programs (DMP), its growth is observed among the population of Kazakhstan [3]. It is essential to assess recent changes and forecast future diabetes, chronic heart failure and hypertension rates at the metropolitan level to develop policy measures and activities to reduce diabetes among the population.

Aim: To study incidence and mortality rate trends from three nosologies included in DMP: diabetes mellitus (DM), chronic heart failure (CHF), and arterial hypertension in Almaty City.

Materials and methods. Retrospective data were studied, obtained from the National Scientific Center for Health Development in Almaty. The incidence data were analyzed from 2016 to 2023 when DMP was implemented in all PHC facilities. Consequently, we calculated trends for type 2 diabetes mellitus, chronic heart failure, and hypertension in 2026. We got mortality data from 2013 to 2023; thus, the trends were calculated until 2028 per 100,000 population.

Incidence and mortality rates were calculated using standard methods per 100,000 population.

To predict the number of incidence and mortality for three types of nosologies, the linear regression method was used according to the formula: $y = a + b \cdot x$

where: y – dependent variable; x – independent variable; a and b are regression coefficients.

To calculate regression coefficients, the following formulas are used:

$$a = \frac{\sum y - b \sum x}{n}$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

Statistical analysis provided using IBM SPSS Statistics package as well as Microsoft Excel programs.

Results

The incidence per 100,000 population for all three nosologies is growing in all age groups. In particular, the highest growth is observed in the age group of 18-44 years, almost twofold or more in the period from 2016 to 2023, where for DM it increased from 144.2 to 363.3, for hypertension from 498.6 to 1046.6 and for CHF from 11.8 to 63.0. With increasing age, the number of patients for all three nosologies increases (table 1).

The DM is expected to increase by 2026 to 65.244 compared to 28.920 in 2016—more than twice. The most significant increase was observed in young people, from 1.183 to 3.931, three times. while in other age groups, it is about twice (P < 0.001) Table 2.

Table 1.

Incidence per 100,000 people for three nosologies included in the Disease management programs.

Years/age	2016	2017	2018	2019	2020	2021	2022	2023
Diabetes mellitus								
18-44	144.2	150.2	173.7	202.5	228.0	265.7	321.4	363.3
45-59	2949.7	3060.2	3321.9	3582.9	3587.2	3831.5	3888.8	4068.6
60-74	9513.0	10106.3	11189.8	12262.1	12475.8	12732.3	12426.2	12780.8
over 75	10716.9	10626.2	11049.4	11986.3	12291.4	12655.0	13874.1	14478.7
Total	2230.5	2349.1	2595.6	2879.7	2981.5	3154.7	3455.1	3621.3
Arterial hypertension								
18-44	498.6	562.6	672.6	746.4	731.4	774.6	891.5	1046.6
45-59	10136.0	11428.9	13133.3	13881.7	13467.9	13677.0	13225.9	**13315.3**
60-74	25832.3	30883.1	37772.6	41376.1	42182.2	42464.5	40148.1	**40851.1**
over 75	29480.7	34635.5	40067.7	43751.5	45529.8	47681.3	50317.5	51819.2
Total	6596.9	7785.9	9350.2	10281.2	10504.5	10859.1	11447.4	11811.3
Chronic heart failure								
18-44	11.8	19.0	31.6	33.7	41.7	50.4	56.5	63.0
45-59	336.1	455.0	677.8	739.1	855.8	1004.6	1001.5	1118.9
60-74	1330.4	1918.0	3071.3	3416.7	4036.8	4738.2	4674.1	5109.1
over 75	2217.1	3015.4	4655.1	5162.0	6295.1	7643.1	8533.8	9216.2
Total	321.8	457.1	723.1	809.3	972.9	1168.5	1293.8	1432.9

Similarly, to diabetes, an increase in hypertension was revealed from 85.534 in 2016 to 178.899 by 2023, and its increase is expected to be 149.631 by 2026. The increase is observed more than twice; in particular, the most significant increase was revealed in the age group of 60-74 years more than three times, and young people 18-44 more than 2.5 times, while in other age groups, it was about two times (Table 2). Regarding CHF, we can say there is a rapid increase from 4173 to 21704 from 2016 to 2023, and its growth to 29156 is expected by 2026. As in hypertension, the most tremendous increase is observed in the age group of 60-74 years and young age of 18-44 years (Table 2).

Table 2.

Trend in three nosology's, including patients in the disease management programs (DMP).

Years	18-44	45-59	60-74	Over 75	Total	DMP
1	2	3	4	5	6	7
Diabetes mellitus						
2016	1183	8196	13436	6105	28920	203
2017	1254	8716	14938	6248	31156	804
2018	1474	9694	17459	6563	35190	5124
2019	1744	10670	20453	6994	39861	11119
2020	1999	10932	22292	7035	42258	21748
2021	2369	11896	24297	7166	45728	27312
2022	2769	12678	26843	8259	50549	29757
2023	3239	13592	28703	9316	54850	26942
2024	3338	14249	31164	9053	57804	37294
2025	3635	15017	33411	9462	61524	42164
2026	3931	15784	35658	9871	65244	47035

Continuation of the table 1.

1	2	3	4	5	6	7
a	-596801.92	-1538688.67	-4516739.83	-819389.83	-7471620.25	-9820815.00
b	296.51	767.26	2246.99	409.31	3720.07	4870.61
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arterial hypertension						
2016	4091	28164	36485	16794	85534	204
2017	4697	32552	45648	20365	103262	403
2018	5707	38326	58935	23799	126767	12353
2019	6428	41340	69015	25529	142312	39505
2020	6412	41043	75372	26059	148886	68768
2021	6906	42464	81035	27000	157405	88550
2022	7680	43118	86728	29953	167479	90212
2023	9332	44482	91743	33342	178899	86312
2024	9363	48535	103738	34672	196307	118448
2025	10020	50668	111653	36742	209082	134040
2026	10677	52801	119568	38812	221858	149631
a	-1320284.67	-4268681.42	-15916294.50	-4155707.08	-25660967.67	-31438000.58
b	656.94	2133.01	7915.04	2070.35	12775.33	15591.13
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chronic heart failure						
2016	97	934	1879	1263	4173	75
2017	159	1296	2835	1773	6063	88
2018	268	1978	4792	2765	9803	908
2019	290	2201	5699	3012	11202	2080
2020	366	2608	7213	3603	13790	4862
2021	449	3119	9042	4328	16938	7190
2022	487	3265	10097	5080	18929	8247
2023	562	3738	11474	5930	21704	8157
2024	630	4176	12936	6388	24131	10326
2025	696	4573	14338	7037	26643	11742
2026	761	4969	15740	7685	29156	13159
a	-132231.00	-798267.25	-2824012.92	-1306416.92	-5060928.08	-2856935.33
b	65.64	396.46	1401.65	648.62	2512.38	1416.63
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

In 2016, the number of patients with diabetes mellitus included in the DMP was 203 people (0.70%) out of all 28.920 registered patients. The most significant number of patients who were included in the DMP were with a diagnosis of diabetes mellitus, from 0.70% to 49.12% from 2016 to 2023. Similarly, with hypertension, in the first year of DMP implementation, 0.24% of the total number of registered patients with hypertension was included, which increased to 48.25% by 2023. In the first year of DMP implementation, 1.80% of patients with CHF were involved in this program; however, in 2017, a decrease in the coverage of patients included in the DMP to 1.45% was revealed, although in subsequent years, there an increase to 37.58% by 2023. It is worth noting that since 2021, there has been a decrease in the number of patients involved in the DMP in all three nosologies (Figure 1).
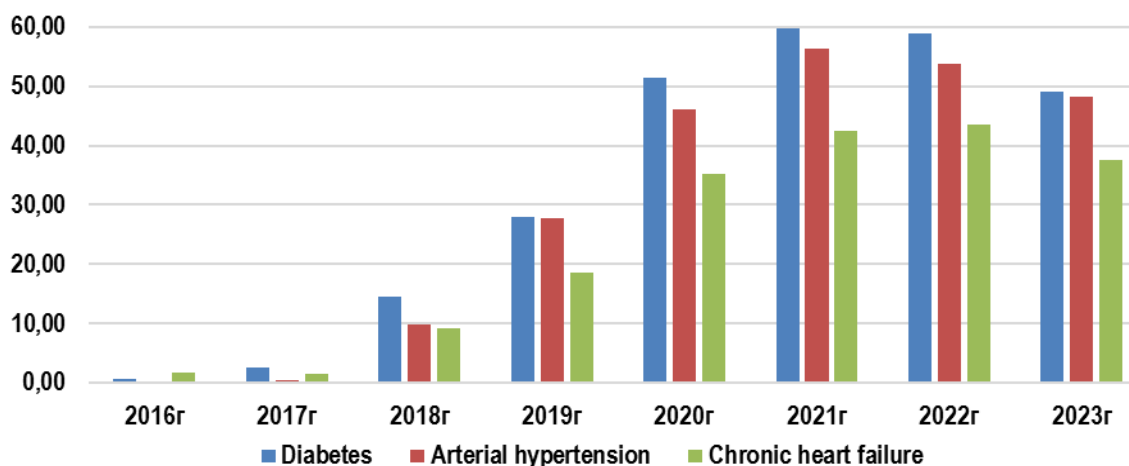

Figure 1. The proportion of patients included in the DMP from the total number of registered cases (%).

Mortality data for three nosology's were obtained from 2013 to 2023, respectively; the forecast was calculated until 2028. An increase in mortality from diabetes mellitus was observed from 2.85 to 22.34, and a further increase to 42.48 per 100,000 population is expected. Similarly, an increase in hypertension was observed from 2.17 to 12.67 from 2013 to 2023, and its growth to 20.58 is expected by 2028. A decrease in CHF was observed from 20.21 to 9.20 by 2023, and a further reduction to 1.24 by 2028 is expected. However, it is worth noting that not all mortality indicators were statistically significant.
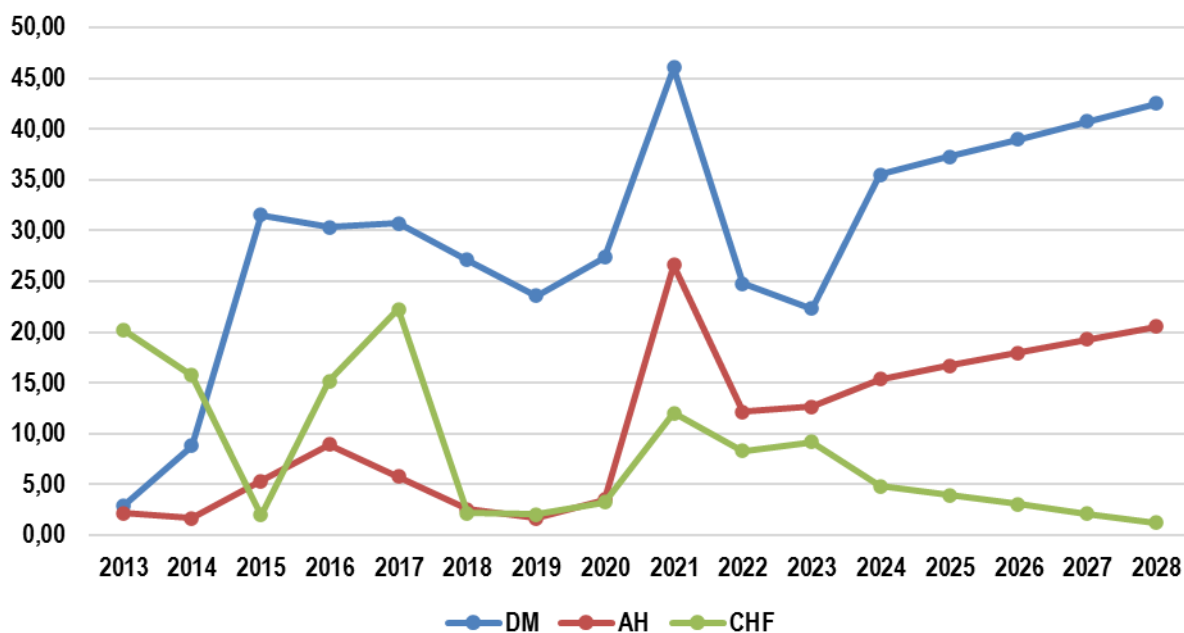

Figure 2. Mortality trend for three nosology's to 100000 populations.

Discussion

There is an increase in both incidence and mortality from diabetes and hypertension, and this poses a serious challenge to health systems. About 40% of Australians over the age of 44 suffer from several chronic diseases, which increases to 50% in people aged 65-74 and up to 70% among people over the age of 85 [5,7]. Our data are similar to those in developed countries, where the incidence of diabetes is expected to increase in particular between 2021 and 2045, accordingly, globally, the costs are expected to increase to US$ 1,054 billion by 2045 [18]. Another study also confirms that the incidence of diabetes is expected to increase at the age of 55 years, while in our study a sharp increase is observed in the age group of 18-44 years. Still, the highest number of registered cases is observed in those over 60 years of age [8]. Globally, there is a more stable mortality rate from diabetes, whereas in our case, a possible increase in mortality has been identified in the next five years [1]. A similar slight reduction in arterial hypertension has been achieved worldwide [10]. The registered cases of CHF in European countries and the USA were from 1-9 cases per 1000 population, and its decrease has been noted in the last decade [16]. This is due to the introduction of new technologies and the development of medicine.

Diabetes is one of the fastest growing health problems worldwide. In many countries, health services are facing an increase in morbidity, mortality and significant costs associated with complications of diabetes. Teaching patients self-control techniques and providing behavioral support are crucial to reduce the risk of complications and improve blood glucose control. The introduction of such methods in primary health care can significantly improve the quality of life of patients and reduce the burden on health

systems. Consultations with a nutritionist in primary health care institutions play an important role in improving the quality of nutrition and in the treatment of chronic diseases such as diabetes. Studies show that regular consultations with a nutritionist can have a positive effect on blood glucose and glycated hemoglobin levels in diabetic patients. This highlights the importance of structured interaction between the patient and medical professionals, which includes individual consultations, constant monitoring of the patient's condition and the provision of materials for self-monitoring of the health status [8].

One of the key aspects of successful treatment is the adaptation of interventions to the specific needs of the patient. This may include various strategies aimed at increasing the patient's knowledge of his disease and treatment options. Independent monitoring of symptoms also plays an important role, as well as encouraging patients to self-treatment in accordance with an individual action plan, especially in case of worsening symptoms or exacerbation of the disease. Additional methods, such as psychological support and stress management strategies, can also significantly improve the effectiveness of treatment. Patients need to be helped in developing responsibility for compliance with the medication regimen and in adopting a healthy lifestyle. After the initial consultation, it is extremely important to organize follow-up of the patient. It can include individual feedback, monitoring progress towards achieving goals, and improving problem-solving and decision-making skills. The basis for effective interventions are theoretical models that provide a structured approach to self-control and self-management in treatment. The effectiveness of such interventions has been confirmed by improved clinical indicators, improved health-related quality of life, and increased patient confidence in

their self-management abilities. In addition, patients gain deeper knowledge about their disease and better control its course. Patient self-management support is recognized as one of the most effective methods of treating chronic diseases, especially such as diabetes and hypertension. This approach makes it possible to achieve statistically significant improvements in the condition of patients [4].

Modern healthcare systems, which are mainly focused on emergency care, face difficulties in providing organized care for people with chronic diseases that require long-term monitoring and treatment. However, it is the primary health care institutions, due to their ability to ensure continuity, coordination and complexity of treatment, that are the most suitable for this task. Effective primary care systems can not only reduce health care costs, but also improve health outcomes. Therefore, it is important to refocus health policy on the creation of proactive systems for the treatment of chronic diseases [4,5].

It is also important to note that the role of the development of public health programs and the support of patients in the fight against cardiovascular disease has reduced risk factors. In addition, population literacy is essential for the healthcare system, which promotes people's understanding of risk factors and allows them to reduce their risks [4]. However, in our country, studies emphasize the low health literacy of the population [9,17], although primary health care has preventive departments that include functions such as population education. Also, diabetes and arterial hypertension schools were created in primary health care, and perhaps their activities contributed to a decrease in mortality from CHF.

Conclusion

Thus, our analysis shows an increase in the incidence of all three nosologies, in particular, diabetes and CHF at a young age, while hypertension and CHF in the age group of 60-74 years. Positive dynamics is improving the coverage of patients involved in the PHC. Still, there has been a decrease in the proportion of patients in all three nosologies in the last two years, which requires studying the reasons that may be associated with the reluctance of patients to participate in the PHC or the fact that medical personnel do not invite them to join in the PHC.

Literature:

1.   *Antini C., Caixeta R., Luciani S., Hennis A.J.M.* Diabetes mortality: trends and multi-country analysis of the Americas from 2000 to 2019. Int J Epidemiol. 2024 Feb 1;53(1). doi: 10.1093/ije/dyad182.

2.   *Beissova A., Kamkhen V., Turbekova M., Malgazhdarov M., Koshkimbayeva S., Kozhabek L.* Epidemiological Features of Diabetes in Kazakhstan in 2018-2021 (Population Study). Med J Islam Repub Iran. 2023 Apr 10. 37:35. doi: 10.47176/mjiri.37.35.

3.   *Chan B.T., Rauscher C., Issina A.M., Kozhageldiyeva L.H., Kuzembaeva D.D., Davis C.L., Kravchenko H., Hindmarsh M., McGowan J., Kulkaeva G.* A programme to improve quality of care for patients with chronic diseases, Kazakhstan. Bull World Health Organ. 2020 Mar 1;98(3):161-169. doi: 10.2471/BLT.18.227447. Epub 2019 Jan 27.

4.   *Coughlin S.S., Vernon M., Hatzigeorgiou C., George V.* Health Literacy, Social Determinants of Health, and Disease Prevention and Control. J Environ Health Sci. 2020;6(1):3061. Epub 2020 Dec 16.

5.   GBD 2021 Diabetes Collaborators. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. Lancet. 2023 Jul 15;402(10397):203-234. doi: 10.1016/S0140-6736(23)01301-6. Epub 2023 Jun 22. Erratum in: Lancet. 2023 Sep 30;402(10408):1132. doi: 10.1016/S0140-6736(23)02044-5.

6.   *Galiyeva D., Gusmanov A., Sakko Y., Issanov A., Atageldiyeva K., Kadyrzhanuly K., Nurpeissova A., Rakhimzhanova M., Durmanova A., Sarria-Santamera A., Gaipov A.* Epidemiology of type 1 and type 2 diabetes mellitus in Kazakhstan: data from unified National Electronic Health System 2014-2019. BMC Endocr Disord. 2022 Nov 11;22(1):275. doi: 10.1186/s12902-022-01200-6.

7.   Diabetes. Key facts. Available at: https://www.who.int/news-room/fact-sheets/detail/diabetes (accessed 5 April 2023)

8.   *Khan M.A.B., Hashim M.J., King J.K., Govender R.D., Mustafa H., Al Kaabi J.* Epidemiology of Type 2 Diabetes - Global Burden of Disease and Forecasted Trends. J Epidemiol Glob Health. 2020 Mar;10(1):107-111. doi: 10.2991/jegh.k.191028.001.

9.   *Kayupova G., Turdaliyeva B., Tulebayev K., Van Duong T., Chang P.W., Zagulova D.* Health Literacy among Visitors of District Polyclinics in Almaty, Kazakhstan. Iran J Public Health. 2017 Aug;46(8):1062-1070.

10.   *Lu W.L., Yuan J.H., Liu Z.Y., Su Z.H., Shen Y.C., Li S.J., Zhang H.* Worldwide trends in mortality for hypertensive heart disease from 1990 to 2019 with projection to 2034: data from the Global Burden of Disease 2019 study. Eur J Prev Cardiol. 2024 Jan 5;31(1):23-37. doi: 10.1093/eurjpc/zwad262.

11.   *Mills K.T., Stefanescu A., He J.* The global epidemiology of hypertension. Nat Rev Nephrol. 2020 Apr;16(4):223-237. doi: 10.1038/s41581-019-0244-2.

12.   NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. Lancet. 2021 Sep 11;398(10304):957-980. doi: 10.1016/S0140-6736(21)01330-1. Epub 2021 Aug 24. Erratum in: Lancet. 2022 Feb 5;399(10324):520. doi: 10.1016/S0140-6736(22)00061-7.

13.   *Pham B.N., Jorry R., Abori N., Silas V.D., Okely A.D., Pomat W.* Non-communicable diseases attributed mortality and associated sociodemographic factors in Papua New Guinea: Evidence from the Comprehensive Health and Epidemiological Surveillance System. PLOS Glob Public Health. 2022 Mar 25;2(3). doi: 10.1371/journal.pgph.0000118.

14. *Saeedi P., Salpea P., Karuranga S., Petersohn I., Malanda B., Gregg E.W., Unwin N., Wild S.H., Williams R.* Mortality attributable to diabetes in 20-79 years old adults, 2019 estimates: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract. 2020 Apr. 162:108086. doi: 10.1016/j.diabres.2020.108086.

15. *Savarese G., Becher P.M., Lund L.H., Seferovic P., Rosano G.M.C., Coats A.J.S.* Global burden of heart failure: a comprehensive and updated review of epidemiology. Cardiovasc Res. 2023 Jan 18;118(17):3272-3287. doi: 10.1093/cvr/cvac013. Erratum in: Cardiovasc Res. 2023 Jun 13;119(6):1453. doi: 10.1093/cvr/cvad026.

16. *Shahim B., Kapelios C.J., Savarese G., Lund L.H.* Global Public Health Burden of Heart Failure: An Updated Review. Card Fail Rev. 2023 Jul 27;9. doi: 10.15420/cfr.2023.05.

17. *Shayakhmetov S.S., Toguzbayeva K.K., Ismailova A.A., Tabibi R., Derbishalieva Z.K., Dzhusupov K.O.* Health Literacy of Rural Population of Kazakhstan. Iran J Public Health. 2020 Jul;49(7):1269-1277. doi: 10.18502/ijph.v49i7.3580.

18. *Sun H., Saeedi P., Karuranga S., Pinkepank M., Ogurtsova K., Duncan B.B., Stein C., Basit A., Chan J.C.N., Mbanya J.C., Pavkov M.E., Ramachandaran A., Wild S.H., James S., Herman W.H.*, Zhang P., Bommer C., Kuo S., Boyko E.J., Magliano D.J. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pract. 2022 Jan. 183:109119. doi: 10.1016/j.diabres.2021.109119. Epub 2021 Dec 6. Erratum in: Diabetes Res Clin Pract. 2023 Oct. 204:110945. doi: 10.1016/j.diabres.2023.110945.

19. *Yerdessov S., Kadyrzhanuly K., Sakko Y., Gusmanov A., Zhakhina G., Galiyeva D., Bekbossynova M., Salustri A., Gaipov A.* Epidemiology of Arterial Hypertension in Kazakhstan: Data from Unified Nationwide Electronic Healthcare System 2014-2019. J Cardiovasc Dev Dis. 2022 Feb 5;9(2):52. doi: 10.3390/jcdd9020052.

Information about the authors:
Dzhumagazieva Oryngul Dzhenisbekovna – Master, Assistant of the Department of Nursing, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan; dzhumagazieva.o@kaznmu.kz; https://orcid.org/0000-0003-0457-7205

Kumar Ainur Bakdauletkyzy – PhD, Associate Professor of the Department of Health Policy and Management, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan; e-mail: a.kumar@kaznmu.kz; https://orcid.org/0000-0003-0457-7205

Faizullina Kamila Mukhametkaliyevna – PhD, Director of the AGF RSE on the Right of Economic Management "National Scientific Center of Health Protection named after S. Kairbekova" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan; e-mail: faizullina.k@kaznmu.kz; https://orcid.org/0000-0002-2031-9444

Akhtaeva Nazgul Smailkhanovna – PhD, Associate Professor of the Department of Biostatistics and Fundamentals of Evidence-Based Medicine, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan; e-mail: akhtaeva.n@kaznmu.kz. https://orcid.org/0000-0002-0835-9814

Akhmetzhan Anuar Dulatovich – MD, PhD, Associate Professor of the Department of Health Policy and Management, ahmetzhan.a@kaznmu.kz. https://orcid.org/0009-0009-7451-9706

Merekesh Brimzhanova – Assistant of the Department of Epidemology with a course on HIV infection, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan; e-mail: dihan81@mail.ru, Tel: 87082884381, 87014609098; https://orcid.org/0009-0008-9269-8982

Venera Baurzhan - Pharmacist (chemist) of the Hospital of the Medical Center of the Presidential Administration of the Republic of Kazakhstan; e-mail: venerily@icloud.com, 8777 127 03 05 Place of work: Kazakh National Medical University named after S.D. Asfendiyarov (KNMU, Almaty).

Corresponding author:
Dzhumagazieva Oryngul Dzhenisbekovna – Master, Assistant of the Department of Nursing, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan;
Address: Republic of Kazakhstan, Gagarina Street 117/14.
E-mail: dzhumagazieva.o@kaznmu.kz; https://orcid.org/0000-0003-0457-7205
Phone: +7 777 366 33 77