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TRENDS IN MORBIDITY AND MORTALITY FROM CHRONIC HEART FAILURE IN ALMATY

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Abstract

Introduction. Heart failure (HF) is a significant public health problem, especially in the context of increasing life expectancy and an aging population. Data provided by the European Society of Cardiology shows a median prevalence of HF in 2019 of 17 cases per 1,000 people, with differences across countries. There is also an increase in the number of cases of cardiovascular diseases in Kazakhstan.

Aim. To analyze the incidence of diseases and the death rate from chronic heart failure (CHF) in the city of Almaty.

Materials and methods. A retrospective study was conducted. We analyzed the incidence and mortality from CHF in Almaty from 2013 to 2022 based on data provided by the National Scientific Center for Health Development, a branch in Almaty. CHF mortality was predicted for the next five years using the TREND function in Excel. We also used a natural logarithmic linear model to analyze the constant percentage change in velocity over time. A p value of less than 0.05 is considered statistically significant.

Results. A study of the incidence and mortality from CHF in Almaty from 2013 to 2023 revealed an increase in the incidence from 9885 to 15332 cases, reaching a peak decrease in 2015 to 7748. While the death rate decreased from 6.5 to 3.0 per 100,000 population. The forecast for the next five years shows the likelihood of a further increase in morbidity. The number of patients registered at the dispensary with congestive heart failure has increased from 232 to 7160, and further growth is expected by 2027. There is also an increase in treated cases.

Conclusion. A further increase in the incidence and mortality from CHF is predicted in the next five years, which underscores the need to implement cardiorehabilitation programs involving multidisciplinary teams and patient-centered care principles to improve the quality of life of patients with CHF. Working to reduce risk factors such as alcohol consumption, smoking, and improved nutrition, with the participation of all stakeholders, contributes to improving performance.

Keywords: heart failure, cardiovascular diseases, morbidity, mortality.

Резюме

ТЕНДЕНЦИИ ЗАБОЛЕВАЕМОСТИ И СМЕРТНОСТИ ОТ ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ В ГОРОДЕ АЛМАТЫ

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Введение. Сердечная недостаточность (СН) представляет собой значительную проблему в сфере общественного здравоохранения, особенно в контексте увеличения продолжительности жизни и старения населения. Данные, представленные Европейским обществом кардиологов, показывают медианную распространенность СН в 2019 году, составляющую 17 случаев на 1000 человек, с различиями в разных странах. В Казахстане также отмечается увеличение числа случаев сердечно-сосудистых заболеваний.

Цель. Анализ частоты заболеваний и уровня смертности от хронической сердечной недостаточности (ХСН) в городе Алматы.

Материалы и методы. Было проведено ретроспективное исследование. Мы анализировали заболеваемость и смертность от ХСН в городе Алматы с 2013 по 2022 годы на основе данных, предоставленных Национальным научным центром развития здравоохранения, филиалом в г. Алматы. Был проведен анализ прогнозирования смертности от ХСН на следующие пять лет с использованием функции TREND в Excel. Мы также использовали естественную логарифмическую линейную модель для анализа постоянного процентного изменения скорости с течением времени. Значение p менее 0,05 считается статистически значимым.

Результаты. В ходе исследования заболеваемости и смертности от ХСН в городе Алматы с 2013 по 2023 год выявлен рост заболеваемости с 9885 до 15332 случаев, достигнув пика снижения в 2015 году до 7748. Тогда как показатель смертности снизился с 6,5 до 3,0 на 100 000 населения. Прогноз на следующие пять лет показывает вероятность дальнейшего увеличения заболеваемости. Количество пациентов, находящихся на диспансерном учете с застойной сердечной недостаточностью, увеличилось с 232 до 7160, ожидается дальнейший рост к 2027 году. Отмечается также рост пролеченных случаев.

Выводы. Прогнозируется дальнейший рост заболеваемости и смертности от ХСН в ближайшие пять лет, что подчеркивает необходимость внедрения кардиореабилитационных программ с участием мультидисциплинарных команд и принципов пациентоориентированной помощи для улучшения качества жизни пациентов с ХСН. Работа по снижению факторов риска, таких как употребление алкоголя, курение, и улучшение питания, с участием всех заинтересованных сторон способствует улучшению показателей.

Ключевые слова: сердечная недостаточность, сердечно-сосудистые заболевания, заболеваемость, смертность.

Түйіндеме

АЛМАТЫ ҚАЛАСЫНДА СОЗЫЛМАЛЫ ЖҮРЕК ЖЕТКІЛІКСІЗДІГІНЕН СЫРҚАТТАНУШЫЛЫҚ ЖӘНЕ ӨЛІМ-ЖІТІМ ҮРДІСТЕРІ

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Кіріспе. Жүрек жеткіліксіздігі (ЖЖ) денсаулық сақтау саласында, әсіресе халықтың өмір сүру ұзақтығы мен қартаюының артуы жағдайында маңызды мәселе болып табылады. Еуропалық кардиология қоғамы ұсынған деректер 2019 жылы әр түрлі елдерде айырмашылықтары бар 1000 адамға шаққанда 17 жағдайды құрайтын ЖЖ орташа таралуын көрсетеді. Қазақстанда жүрек-қан тамырлары ауруларының саны да артып келеді.

Бұл зерттеудің мақсаты Алматы қаласында созылмалы жүрек жеткіліксіздігінен (СЖЖ) болатын аурулардың жиілігін және өлім-жітім деңгейін талдау болып табылады.

Зерттеу әдістері. Ретроспективті зерттеу жүргізілді. Біз денсаулық сақтауды дамытудың Ұлттық ғылыми орталығы, Алматы қаласындағы филиал ұсынған деректер негізінде 2013-2022 жылдар аралығында Алматы қаласында СЖЖ-нен сырқаттанушылық пен өлімді талдадық. Excel-дегі TREND функциясын қолдана отырып, келесі бес жыл ішінде СЖЖ-нен болатын өлім-жітімді болжау жүргізілді. Уақыт өте келе жылдамдықтың тұрақты пайыздық өзгеруін талдау үшін біз табиғи логарифмдік сызықтық модельді қолдандық. 0,05-тен төмен p мәні статистикалық маңызды болып саналады.

Нәтижелері. 2013 жылдан 2023 жылға дейін Алматы қаласында СЖЖ-нен сырқаттанушылық пен өлім-жітімді зерттеу барысында сырқаттанушылықтың 9885-тен 15332 жағдайға дейін өсуі анықталып, 2015 жылы 7748-ге дейін төмендеу шыңына жетті. Ал өлім көрсеткіші 100 000 тұрғынға шаққанда 6,5-тен 3,0-ге дейін төмендеді. Алдағы бес жылға арналған болжам аурудың одан әрі жоғарылау ықтималдығын көрсетеді. Жүрек жеткіліксіздігі бар диспансерлік есепте тұрған пациенттердің саны 232-ден 7160-қа дейін өсті, 2027 жылға қарай одан әрі өсу күтілуде. Емделген жағдайлардың өсуі де байқалады.

Қортынды. Алдағы бес жылда СЖЖ-нен сырқаттанушылық пен өлім-жітімнің одан әрі өсуі болжанып отыр, бұл СЖЖ-мен ауыратын науқастардың өмір сүру сапасын жақсарту үшін көпсалалы топтар мен науқасқа бағдарланған көмек принциптерінің қатысуымен кардиореабилитациялық бағдарламаларды енгізу қажеттігін атап көрсетеді. Қауіп факторларын азайту бойынша жұмыс алкогольді тұтыну, темекі шегу, және тамақтануды жақсарту сияқты, барлық мүдделі тараптардың қатысуымен көрсеткіштердің жақсаруына ықпал етеді.

Түйінді сөздер: жүрек жеткіліксіздігі, жүрек-қан тамырлары аурулары, ауру, өлім.

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Introduction

Heart failure (HF) is primarily public health problems worldwide. New developments in different field including healthcare sector lead as to improve the population life as well as their life expectancy. In the last decade, many countries have faced with an increase in population aging, which consequently leads to a rise in morbidity and mortality from various chronic diseases, including heart failure [2,6,19].

According to a study by Gianluigi Savarese, it was identified that heart failure can affects more than 64 million people in whole world [7,9,11]. The prevalence of HF varies from country to country. For example, in Europe in 2019, the average prevalence was 17 cases per 1,000 people, which was ranged with minimum indicator approximate ≤ 12 in Greece and Spain to maximum >30 in Lithuania and Germany [17]. While in the USA in 2021, the prevalence of HF is about 2.5% [21]. In England, there is also an increase in the number of cases of HF, with the frequency of detected cases increasing from 4.1 to 4.9 per 1000 person-years, whereas the prevalence increased from 2.1% to 2.4% [1]. In Asian countries, the prevalence of HF ranged between 0.4 to 6%, for instance 0.4% in Thailand, 0.6% in South Korea, 1-2% in the Philippines and more than 2% in Hong Kong (3%), in Indonesia (5%), in Taiwan (6%) [15]. It was predicted that the prevalence of HF in the United States can be increased by 46% by 2030; consequently this situation will lead to increase in health care costs of about 127% [22].

Although the prognosis for HF has improved in recent decades, the implementation of new technologies in healthcare system contributed to the improvement of the prognosis for HF; however, the mortality and hospitalization rates remain high, which is associated with an increase in the aging population and the development of heart or cardiovascular diseases as well as heart failure. The main risk factors for HF are coronary heart disease and hypertension, as well as smoking and obesity. However, all these risk factors can be controlled if patients are trained in self-monitoring tools.

Like many countries in the world, Kazakhstan faces an identical challenge as growth of the cases of the cardiovascular diseases, which was increased per 100,000 inhabitants from 1,845.4 to 2,597.5 between 2004 and 2017. Such a sharp increase may be due to better detection of patients in this group, which were able within the implementation of national health programs that have contributed to improving the early diagnosis of cardiovascular diseases [12,22]. In addition, last research shows that from 2011 to 2021, there was a decrease in

preventable mortality from chronic rheumatic heart disease (I05-I09), hypertensive diseases (I10-I15), coronary heart disease (I20-I25), cerebrovascular diseases (I60-I69), while the average percentage changes showed a significantly decrease about -9.5 ($p = 0.017$). The average percentage changes during 2011 to 2021 was higher in men where the number drop approximately -8,4 whereas for women -7.5 ($p = 0.009$) [16].

However, it is important for all countries to support a policy of universal health coverage, which includes issues of equal access to the entire population, requires the provision of preventive health care [13]. In Kazakhstan, the development of primary health care has become a priority, and appropriate centers and a WHO PHC Demonstration Platform was opened [20]. Conducting an analysis of mortality and morbidity from chronic diseases, in particular heart disease, is necessary for the planning of medical services and the development of effective strategies in the health system.

The purpose of this research is to analyze the incidence and the mortality rate from chronic heart failure in the megacity of the Kazakhstan in Almaty.

Materials and methods. A retrospective study was conducted. To study the morbidity and mortality of chronic heart failure in Almaty, we obtained data for the period from 2013 to 2022. The study design was approved by the Local Committee of KazNMU, Kazakhstan (Protocol No.8 (131) 29.06.2022). The data were obtained by the National Scientific Center for Health Development (NSCHD), a branch in Almaty. The analysis included diseases according to the ICD-10 code - Heart failure includes the following subgroups as I50.0 – congestive heart failure; I50.1 – left ventricular failure; I50.9 – unspecified heart failure. Predicting mortality is necessary for situational analysis, and determining the next steps to develop health policy. Based on data from 2013 to 2022, we have made a mortality forecast for the next five years according to CH. The trend function in Excel is a statistical function that calculates a linear trend line based on a given linear dataset. It calculates the predicted values of Y (year) for the given values of the array X (number of morbidity) and uses the least squares method based on the given two data series. The TREND function in Excel returns numbers as a linear trend corresponding to known data points. That is, the existing data, on the basis of which the trend in Excel predicts the values of Y depending on the values of X, must be linear. Using a natural logarithmic linear model allows you to analyze a constant percentage change in velocity over time. The P-value is less than 0.05 as statistically significant.

Results

The incidence of CHF in accordance with I50.0-I50.9 for the period from 2013 to 2023 increased from 9885 to 15332, where the peak decrease in CHF was observed in 2015 to 7748. Based on the incidence data for ten years,

our forecast showed the probability of an increase in CHF in the next five years to 17267 (Figure 1). Based on trend analysis, we obtained the regression equation $y = 617.6 \cdot x - 1234567$, which accurately describes the prognosis of morbidity ($p = 0.0008$).

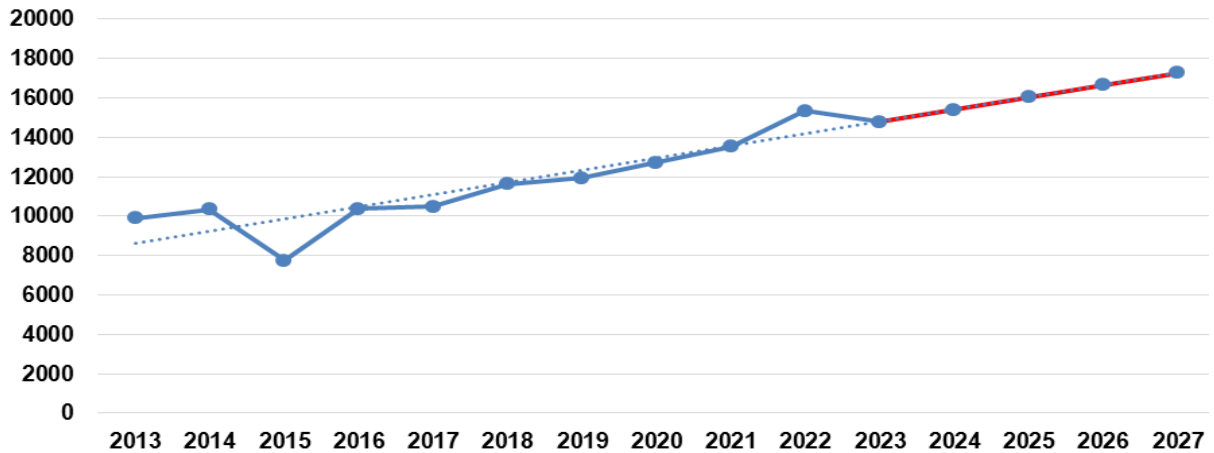


Figure 1. The prognosis of the incidence of CHF (ICD-I50.0-I50.9).

Analysis of indicators I50.0 – congestive heart failure from 6.5 to 3.0 between 2013 and 2022, but the forecast revealed a possible increase to 12.0 per 100,000

population by 2027 (Figure 2). Based on trend analysis, we obtained the regression equation $y = 0.939 \cdot x + 1892.53$, which describes the prognosis of morbidity ($p = 0.102$).

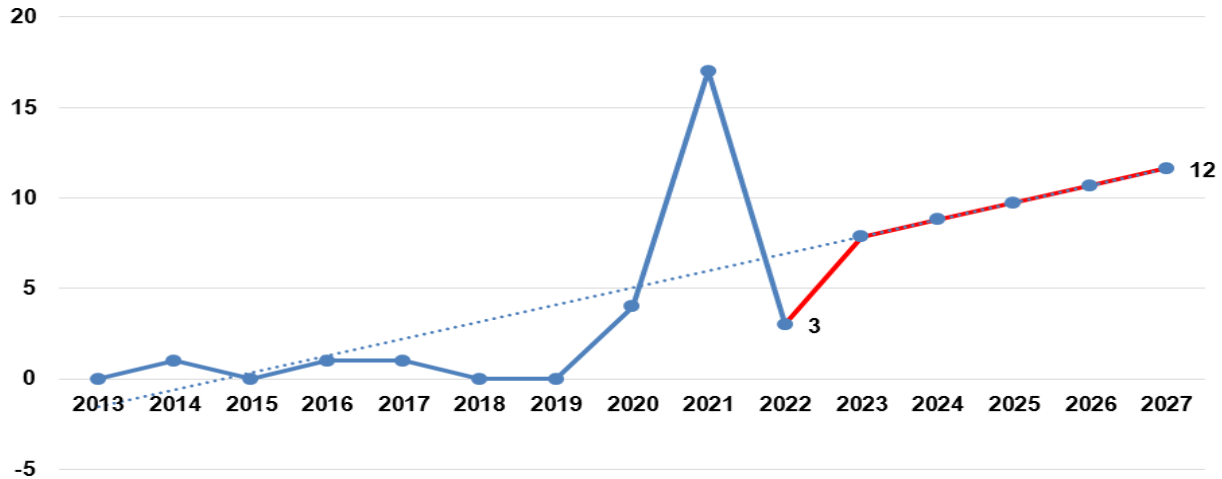


Figure 2. Prognosis of mortality from congestive heart failure (ICD-I50.0).

The number of patients registered at the dispensary with congestive heart failure (I50.0) increased from 232 to 7160 between 2013 and 2022. There is a slight decrease to 7,590 by 2023, followed by an increase to 10969 by 2027 (Figure 3).

Based on trend analysis, we obtained a regression equation $y = 771.103 \cdot x - 1553002.964$, which adequately describes the prognosis of morbidity ($p < 0.001$). The number of dispensary patients increases by 771 people every year.

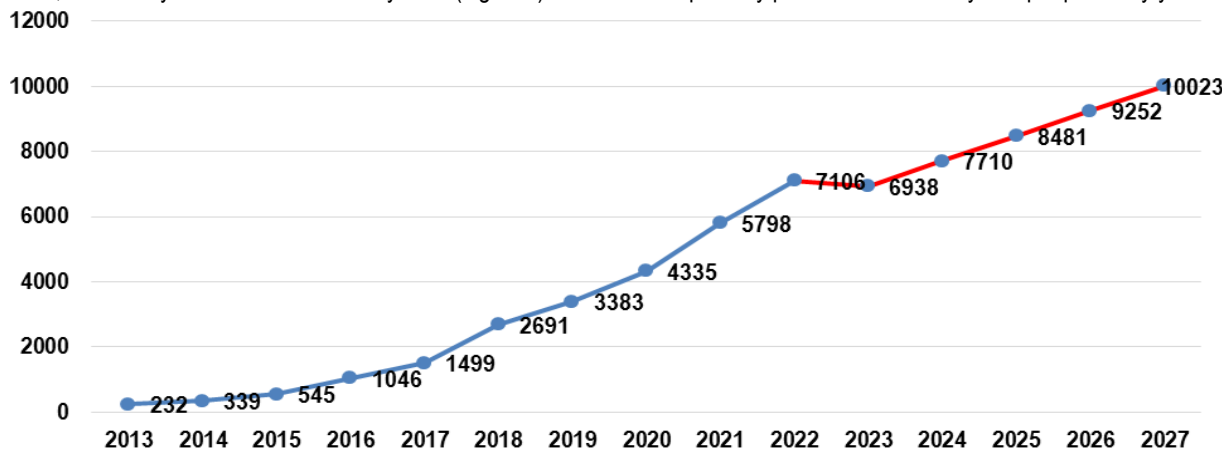


Figure 3. The amount of patients with congestive heart failure registered at the dispensary (I50.0).

Analysis of indicators I50.1 – left ventricular failure

Left ventricular failure mortality rate (I50.1) per 100,000 population was high in 2022, where the figure was 0.54 per 100,000 population. In general, for the studied 2013-2022, this indicator varied by an average of 0.16. The forecast for the next five shows a likely decrease to 0.48 compared to

2002, and the expected peak of decline is likely to be 0.35 per 100,000 population in 2023 (Figure 4).

Based on trend analysis, we obtained a regression equation $y = 0.03 \cdot x - 68.445$, which describes the prognosis of morbidity ($p = 0.071$). The trend results show an increase in mortality.

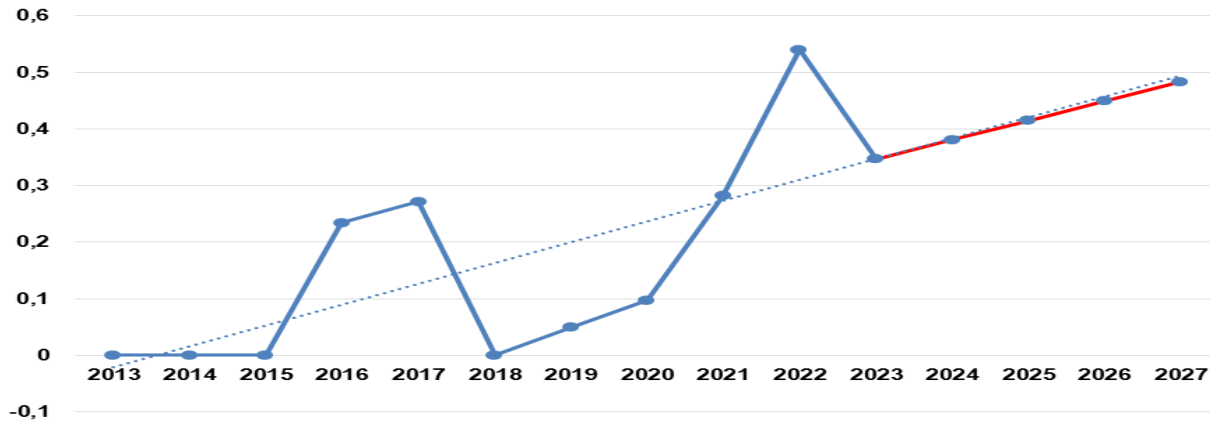


Figure 4. Prognosis of mortality from left ventricular failure (ICD-I50.1).

In addition, according to this nosology, the number of patients on dispensary observation increased from 9 to 683 in the period from 2013 to 2022. It is necessary to emphasize a significant increase in the period of COVID-19 c284 in 2019 to 683 in 2022. In the next five years, a further increase in the dispensary group of patients with HF with left ventricular failure is projected to 946 in 2027 (Figure 5).

Based on trend analysis, we obtained a regression equation $y = 73.56 \cdot x - 148156$, which adequately describes the prognosis of morbidity ($p < 0.001$). The number of patients registered at the dispensary with HF with left ventricular insufficiency increases by 74 people every year.

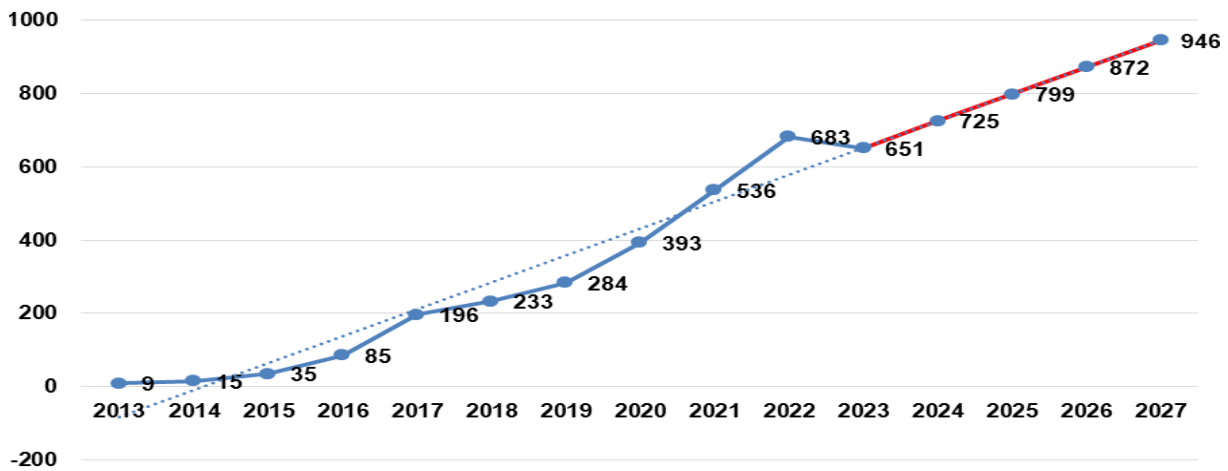


Figure 5. The number of patients registered for dispensary HF with left ventricular failure.

Moreover, there has also been an increase in treated cases since 2017, from 2 to 13 cases in 2022, where the

highest figure was 23 cases in 2020. During the study period, three deaths were observed (Table 1).

Table 1.

Treated cases related to CHF.

	I50.1		I50.0	
	Total treated	The total number of deaths	Total treated	The total number of deaths
2013	0	0	3	0
2014	2	0	19	1
2015	0	0	9	0
2016	0	0	6	1
2017	2	1	21	1
2018	4	0	55	0
2019	12	1	122	0
2020	23	0	209	4
2021	17	1	252	17
2022	13	0	455	3

Discussion. Worldwide the distribution of mortality and morbidity of the heart failure is different, for instance in developing countries the data and researches for analysis was less in comparison to developed countries.

Several research presented the high financial burden for treating and managing patients with heart failure, for example, a systematic review found annual costs per patient ranging from US\$908.00 to US\$84,434.00 [14,18]. In other study identified in overall budget spend for patient with HF (\$108 billion in a year) the direct costs was higher in comparison to indirect approximate 60% to 40% respectively [4]. Therefore, since heart failure is often associated with social or controllable factors, reducing its economic impact should be a top priority for health systems and policymakers in all countries.

Many programs with involving different types of population have been introduced to reduce chronic non-communicable diseases, while the most successful experience was in Finland [8]. The experience of Finland is an example that measures aimed at reducing mortality and morbidity from non-communicable diseases require long-term action and the results can be achieved later time. This allowed us to achieve the results, where the incidence of HF is stabilizing and seems to be decreasing in developed countries. However, its prevalence is increasing due to an aging population, as we know, HF increases sharply with age [3]. New diagnostic and treatment methods, as well as government support for the implementation of preventive programs have contributed to improving treatment and preventing premature deaths from coronary heart disease. Accordingly, this could be achieved throughout the using of effective and evidence-based treatments that prolong the life of patients with HF.

To reduce chronic non-communicable diseases, many programs have been introduced involving various categories of the population, with the most successful experience being in Finland [8]. The Finnish experience is an example that measures aimed at reducing mortality and morbidity from noncommunicable diseases require long-term action and results can be achieved later. Ultimately, their experience led to results in which the incidence of heart failure has stabilized and appears to be declining in developed countries. However, its prevalence is increasing due to the aging population, since HF is known to increase sharply with age [3]. Another factor contributing to population longevity is improvements in treatment and survival for coronary heart disease, and the availability of effective, evidence-based treatments that prolong the lives of patients with HF.

The Ministry of Health of the Republic of Kazakhstan is working to improve indicators at the first preventive stage in patients with pre-existing diseases. To do this, Kazakhstan has implemented a Program for the management of chronic noncommunicable diseases, the essence of which is to reduce the number of complications of the underlying disease, in particular, CHF, diabetes mellitus and hypertension. The program was first tested in three pilot regions, and since 2017 it has been implemented in all other regions. In many PHC facilities, HF disease management program coordinated by a multidisciplinary team, where a cardiologist, a general practitioner, a nurse, a healthy lifestyle specialist, a psychologist and a social worker take part in the treatment.

The implementation of this program may have contributed to a decrease in CHF mortality, in particular,

from 2013 to 2019, for instance, according to a World Bank report, the implementation of a disease management program in Kazakhstan has improved treatment adherence in these groups of patients [5]. However, the Covid-19 pandemic has contributed and led to an increase in mortality among this group of patients, as in all countries. Research shows that the negative effect of the pandemic Covid-19 affected patients with chronic diseases to a greater extent [10]. Also, a positive trend is the increase in the number of patients registered at the dispensary, which allows monitoring their condition and adjusting treatment. It is worth noting as well as the worldwide trend of increasing incidence of CHF.

Thus, there is a need for further policy support to improve care for patients with cardiovascular diseases (CVD), which are factors, which lead to the development of CHF. According to the World Health Organization, mortality from CVD has long occupied a leading position in the world and in Kazakhstan. In Kazakhstan, according to data presented by epidemiologists, about 4% of the inhabitants is diagnosed with chronic heart failure, which is mainly a complication of the underlying disease as cardiovascular diseases, in particular hypertension and coronary heart disease. Health information statistics show that arterial hypertension, coronary heart disease, rheumatic malformations and anemia of various origins most often lead to the development of CHF. A policy to work with risk factors among the population to reduce the level of salt in bread, the main food product of Kazakhstan, or alcohol consumption, smoking and other risks should be carried out everywhere with the involvement of stakeholders and other sectors.

Conclusions. Our review shows a growing trend in the number of patients with CHF, and that a significant increase in the number of new cases of CHF is predicted in the future, especially in developing countries. The trend of morbidity and mortality from CHF in Kazakhstan shows a possible increase in the next five years, therefore, the introduction of cardiorehabilitation programs involving a multidisciplinary team and patient-oriented care may contribute to improve the quality of life of patients with CHF.

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