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TITLE CHANGING PATTERNS OF CHRONIC HEART FAILURE INCIDENCE AND MORTALITY

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Abstract

Relevance: Chronic heart failure remains a major public health challenge worldwide, characterized by increasing incidence and significant morbidity and mortality. Understanding epidemiological trends and changes associated with the COVID-19 and post-COVID-19 period is essential for optimizing healthcare strategies.

Objective. To analyze the dynamics of CHF incidence and mortality in Almaty city and Almaty oblast during the pre-COVID-19 and COVID-19/post-COVID-19 periods, and to assess future trends up to 2030.

Materials and Methods. A retrospective descriptive and analytical study was conducted using official statistical data from 2012 to 2025. Indicators of CHF incidence and mortality were analyzed in the general population and by sex. The study period was divided into pre-COVID-19 period (2012-2019) and COVID-19/post-COVID-19 period (2020-2025) phases. Absolute and relative changes were calculated, and time series analysis was performed. Forecasting was carried out using linear regression and ARIMA (0,0,0) models.

Results: Chronic heart failure incidence increased in both regions. In Almaty city, the chronic heart failure incidence rate increased from 1,217.3 to 1,552.2 per 100,000 population (+27.5 %), while in Almaty region it increased from 145.7 to 755.1 per 100,000 population (+418.4 %). The most pronounced growth was observed after 2019. Incidence increased in both sexes, with a higher growth rate among men. Mortality declined in both regions over the study period. Comparison of the pre-COVID-19 and COVID-19/post-COVID-19 periods demonstrated higher incidence rates in both regions, whereas mean mortality rates decreased. Forecasting indicates a continued increase in incidence through 2030, with relatively stable or gradually decreasing mortality.

Conclusion: The study demonstrates a growing burden of chronic heart failure, particularly in Almaty region, with increasing incidence and declining mortality. These findings highlight the need for strengthening early detection, preventive strategies, and long-term management of chronic heart failure, especially in regional healthcare settings.

Keywords: *chronic heart failure, cardiovascular diseases, epidemiology, COVID-19, forecasting, public health, Kazakhstan.*

Introduction

Cardiovascular diseases (hereinafter − CVD) remain the leading cause of mortality worldwide, accounting for approximately 19.8 million deaths in 2022 (approximately 32 % of all deaths), with the majority attributable to myocardial infarction and stroke. Heart failure (hereinafter − HF) represents one of the most severe and common complications of CVD, affecting over 64 million people globally. In developed countries, HF prevalence ranges from 1-3 % in the adult population and exceeds 10 % among individuals older than 70 years [1; 2]. The increasing number of patients is due to the aging of the population, improved survival after myocardial infarction, and the prevalence of hypertension and diabetes. Prevalence and

incidence vary by region but continue to increase overall. Mortality is particularly high in low- and middle-income countries due to limited access to healthcare and preventive care. Risk factors such as smoking, poor diet, obesity, physical inactivity, alcohol, and air pollution play a significant role. Most premature deaths from CVD can be prevented with timely prevention and treatment [3-7].

Heart failure is a condition in which the heart is unable to pump blood effectively due to structural or functional impairment. This leads to symptoms such as shortness of breath, fatigue, decreased exercise tolerance, and edema. The most common causes are coronary artery disease, hypertension, myocardial infarction, and valvular disease [8-10]. The disease develops gradually and is accompanied by changes in the heart (hypertrophy, dilation, fibrosis). Stages range from low-risk, asymptomatic to severe, terminal disease. Heart failure is also classified by ejection fraction, course (acute and chronic), and cardiac involvement (left-, right-, and biventricular). Early diagnosis and treatment help slow disease progression and improve quality of life.

In Kazakhstan, CHF also poses a significant burden on the healthcare system, accompanied by increased morbidity, high disability, and significant economic costs [11]. In Kazakhstan, cardiovascular diseases are also the leading cause of death. Despite healthcare reforms and a 3.8 % annual reduction in preventable mortality from 2015 to 2019, there was a 17.6 % increase from 2019 to 2021, largely due to the COVID-19 pandemic. The leading causes of death remain circulatory diseases, respiratory diseases, and cancer. Heart failure poses a significant burden to the country's healthcare system. According to the national electronic healthcare system, more than 500,000 patients with this diagnosis were registered from 2014 to 2021. Most of these patients are over 50 years of age (86 %), with women accounting for approximately 52 %. Comorbidities such as hypertension, cerebrovascular disease, and coronary heart disease are common. During this period, the prevalence of heart failure increased significantly-from 4,393 to 22,088 cases per million population, and mortality increased from 367 to 721 cases per million. Approximately 14 % of patients died during follow-up. The risk of adverse outcomes is higher in men and in patients with a history of myocardial infarction or diabetes [12-15].

The aim of this study was to analyze temporal trends in CHF incidence and mortality in Almaty city and Almaty region between 2012 and 2025, including comparisons between the pre- and the COVID-19/post-COVID-19 periods. Particular attention was given to describing temporal changes in these epidemiological indicators during the study period. The findings are intended to identify key epidemiological trends and may contribute to healthcare planning, preventive strategies, early detection, and the long-term management of CHF at both urban and regional levels.

Materials and Methods

This retrospective descriptive epidemiological study examined trends in CHF incidence and mortality in Almaty city and Almaty region, Kazakhstan, between 2012 and 2025, with projections extending to 2030. Data were obtained from official statistical reports of the National Scientific Center for Healthcare Development of the Republic of Kazakhstan. The dataset included annual aggregated indicators of CHF incidence and mortality in the general population, as well as sex-specific data for men and women.

Ethics approval and consent to participate

The study protocol was reviewed and approved by the Local Ethics Committee of the Non-Profit Joint-Stock Company «Kazakh-Russian Medical University», Almaty, Kazakhstan (Protocol No. 18/99, dated 6 January 2023) and was conducted in accordance with the principles of the Declaration of Helsinki. As the study was based exclusively on anonymized aggregated official statistical data, informed consent was not required in accordance with institutional requirements.

For descriptive temporal comparisons, the study period was divided into a pre-COVID-19 period (2012-2019) and a COVID-19 and post-COVID-19 period (2020–2025). This classification was used solely to describe temporal changes in epidemiological indicators and should not be interpreted as implying a causal relationship between the COVID-19 pandemic and the observed changes in CHF incidence or mortality.

Statistical analysis: Descriptive statistics, comparative analyses, and time-series methods were used to evaluate changes in CHF incidence and mortality over time. Both absolute numbers of

registered cases and incidence and mortality rates per 100,000 population were analyzed, depending on the objective of each analysis.

The absolute change was determined using the formula:

$\Delta = X_2 - X_1$

The relative change (growth rate) was calculated as follows:

Rate of change (%) = $(X_2 - X_1) / X_1 \times 100$ %

Sex-stratified analyses were performed to evaluate temporal differences between men and women in both study regions.

Forecast analysis: Future trends through 2030 were explored using two complementary forecasting approaches.

First, linear regression was applied to evaluate long-term temporal trends according to the equation:

$y = a + bt$

where y represents the predicted value of the indicator, t represents calendar year, a is the intercept, and b is the regression coefficient describing the temporal trend.

In addition, an ARIMA (0,0,0) model was applied as a baseline stationary scenario. Because this model assumes the absence of both temporal trend and seasonality, it was used as a conservative reference model rather than as a comprehensive forecasting model. Forecasts obtained from linear regression and the baseline ARIMA model were compared to illustrate alternative patterns of future CHF mortality.

Several methodological limitations should be considered when interpreting the findings. The analysis was based exclusively on aggregated statistical data and therefore did not include individual-level information such as age, comorbidities, disease severity, left ventricular ejection fraction, treatment strategies, or clinical outcomes. In addition, potential temporal changes in diagnostic criteria, coding practices, reporting procedures, case registration, healthcare accessibility, and administrative reporting systems may have influenced the observed trends. Consequently, the study was designed to describe temporal epidemiological patterns rather than to identify determinants of CHF incidence or mortality.

All statistical analyses were performed using IBM SPSS Statistics (version 23) and Microsoft Excel. The study was descriptive and exploratory in nature, focusing on the analysis of temporal trends without testing causal relationships.

Results

As shown in Table 1, CHF incidence increased overall in both Almaty city and Almaty region between 2012 and 2025. In Almaty city, incidence rose from 1,217.3 per 100,000 population in 2012 to 1,552.2 per 100,000 in 2025, while in Almaty region it increased from 145.7 to 755.1 per 100,000 population. Incidence increased in both men and women; however, sex-specific differences varied across regions and study years.

Mortality rates fluctuated throughout the study period but remained higher in Almaty city than in Almaty region. By 2025, mortality was 7.1 per 100,000 population in Almaty city and 12.8 per 100,000 in Almaty region. Overall, the findings indicate an increasing burden of CHF incidence over time, accompanied by relatively stable mortality trends (Table 1).

Table 2 summarizes the absolute and relative changes in CHF incidence and mortality between 2012 and 2025. In Almaty city, overall CHF incidence increased by 27.5 %, from 1,217.3 to 1,552.2 per 100,000 population, while mortality decreased by 67.0 %, from 21.5 to 7.1 per 100,000. In Almaty region, the increase in incidence was substantially greater, rising by 418.4 % from 145.7 to 755.1 per 100,000 population, whereas mortality declined by 40.2 %, from 21.4 to 12.8 per 100,000.

Sex-specific analyses have demonstrated increasing incidence in both men and women. However, the magnitude of change varied by region and sex. Mortality declined in both sexes throughout the study period (Table 2).

Table 3 presents a comparison of the mean annual CHF incidence and mortality rates between the pre-COVID-19 period (2012-2019) and the COVID-19 and post-COVID-19 period (2020-2025). In Almaty city, the mean annual CHF incidence increased from 830.1 to 1103.6 per 100,000 population, representing a 33.0 % increase, whereas the mean annual mortality rate decreased from 15.0 to 10.6 per 100,000 population (−29.5 %).

In Almaty region, the mean annual CHF incidence increased from 312.3 to 642.8 per 100,000 population (+105.8 %), whereas the mean annual mortality rate decreased from 12.3 to 8.7 per 100,000 population (−29.0 %).

Sex-specific analyses demonstrated increasing mean annual incidence rates in both men and

Table 1. Dynamics of CHF incidence and mortality in 2012-2025 (per 100,000 population)

Year	Almaty						Almaty region					
	Incidence (overall)			Deaths			Incidence (overall)			Deaths		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
2012	1217.31	823.09	1158.61	21.52	17.15	18.29	145.66	141.57	149.62	21.43	26.01	16.99
2013	792.53	533.87	709.59	23.89	16.57	20.99	113.90	69.33	156.98	25.64	30.46	20.99
2014	798.53	537.72	735.55	18.27	12.80	16.41	454.79	767.79	152.22	19.63	22.68	16.68
2015	596.21	412.64	519.54	2.54	2.79	1.34	490.69	827.56	164.32	12.44	15.46	9.52
2016	782.51	513.41	687.58	19.45	18.19	12.52	242.78	215.04	269.70	4.29	5.85	2.76
2017	775.39	534.75	649.60	28.84	27.79	17.51	331.05	290.15	370.83	4.78	4.62	4.94
2018	826.41	589.39	674.01	2.81	2.43	1.93	327.46	267.15	386.65	4.81	5.53	4.11
2019	851.54	592.73	684.06	2.71	2.12	1.98	391.81	406.68	377.16	4.95	6.61	3.32
2020	886.11	638.98	681.39	4.32	3.29	3.17	581.42	542.63	619.41	6.39	6.97	5.83
2021	910.51	620.16	735.50	11.91	11.77	6.52	770.75	755.47	785.73	8.21	8.15	8.27
2022	1003.87	667.89	783.14	11.46	10.85	6.13	499.83	543.41	456.43	6.97	6.91	7.02
2023	1091.44	690.58	896.14	12.55	12.05	6.74	606.48	622.41	590.58	7.11	8.24	5.97
2024	1177.20	781.52	922.23	16.09	13.32	10.31	643.17	603.39	682.98	10.65	13.71	7.58
2025	1552.20	1087.50	1137.26	7.11	5.91	4.41	755.07	736.88	773.32	12.82	17.40	8.22

Source: completed by authors

Table 2. Absolute and relative changes in CHF indicators (2012-2025)

Variables	2012 Almaty	2025 Almaty	Absolute change	Rate of change, %	2012 Almaty region	2025 Almaty region	Absolute change	Rate of change, %
Incidence, overall	1217.31	1552.20	+334.89	+27.51	145.66	755.07	+609.41	+418.38
Mortality, overall	21.52	7.11	−14.41	−66.96	21.43	12.82	−8.61	−40.18
Incidence, men	823.09	1087.50	+264.41	+32.12	141.57	736.88	+595.31	+420.51
Mortality, men	17.15	5.91	−11.24	−65.54	26.01	17.40	−8.61	−33.10
Incidence, women	1158.61	1137.26	−21.35	−1.84	149.62	773.32	+623.70	+416.86
Mortality, women	18.29	4.41	−13.88	−75.89	16.99	8.22	−8.77	−51.62

Source: completed by authors

women, whereas mean annual mortality rates declined in both sexes in Almaty city and Almaty region (Table 3).

Table 4 presents the observed baseline values for 2025 together with exploratory forecasts of CHF incidence and mortality through 2030. Forecasts indicate a substantial increase in CHF incidence in both regions over the study period. In Almaty city, total incidence is expected to rise from 25,536 cases in 2025 to 45,590 cases in 2030, while in Almaty oblast it is projected to increase from 11,780 to 24,800 cases. The increase is anticipated in both men and women, with a steeper rise among males.

Mortality forecasts showed differing patterns depending on the model used. Linear trend projections suggest a gradual decline in mortality between 2025 and 2030, from 117 to 102 deaths in Almaty city and from 200 to 175 deaths in Almaty region. In contrast, the baseline stationary ARIMA (0,0,0) model predicted relatively stable mortality levels over the forecast period, remaining at approximately 183 deaths in Almaty city and 210 deaths in Almaty oblast. Overall, the forecasts suggest a growing burden of CHF incidence accompanied by stable or modestly declining mortality (Table 4).

Discussion

The present study provides a comprehensive assessment of long-term trends in chronic heart failure incidence and mortality in Almaty city and Almaty region between 2012 and 2025. The findings demonstrate a substantial increase in CHF incidence in both regions, accompanied by an overall decline

Table 3. Comparison of CHF rates before and after COVID-19 (per 100,000 population)

Variables	2012–2019 Almaty, mean	2020–2025 Almaty, mean	Change, %	2012–2019 Almaty region, mean	2020–2025 Almaty region, mean	Change, %
Incidence, overall	830.05	1103.56	+32.95	312.27	642.79	+105.84
Mortality, overall	15.00	10.57	−29.53	12.25	8.69	−29.03
Incidence, men	567.20	747.77	+31.84	373.16	634.03	+69.91
Mortality, men	12.48	9.53	−23.62	14.65	10.23	−30.18
Incidence, women	727.32	859.28	+18.14	253.44	651.41	+157.03
Mortality, women	11.37	6.21	−45.36	9.91	7.15	−27.89

Source: completed by authors

Table 4. Observed baseline values for 2025 and exploratory forecasts of chronic heart failure incidence and mortality in Almaty city and Almaty region, 2025-2030

Year	Mortality (total, linear)	Mortality (ARIMA)	Incidence (total)	Incidence (males)	Incidence (females)
	Almaty				
2025	117	183	25 536	11 597	13 939
2026	114	183	29 500	14 200	15 300
2027	111	183	33 800	17 800	16 000
2028	108	183	38 500	21 500	17 000
2029	105	183	42 800	25 300	17 500
2030	102	183	45 590	29 107	22 275
	Almaty region				
2025	200	210	11 780	5 759	6 021
2026	195	210	13 800	6 900	6 900
2027	190	210	16 200	8 200	8 000
2028	185	210	18 900	9 800	9 100
2029	180	210	21 500	11 400	10 100
2030	175	210	24 800	13 200	11 600

Source: completed by authors

in mortality. These trends are consistent with global observations indicating that improvements in survival from cardiovascular diseases have contributed to a growing population living with CHF, thereby increasing the overall disease burden despite reductions in mortality [1; 4;16].

The increase in CHF incidence was observed in both regions but was considerably more pronounced in Almaty region. Between 2012 and 2025, incidence increased by 27.5 % in Almaty city and by 418.4 % in Almaty region. Several factors may have contributed to these temporal changes. However, because the present study was based on aggregated descriptive data, the relative contribution of these factors could not be evaluated. Previous studies have shown that the burden of CHF rises substantially with age and is closely linked to hypertension, ischemic heart disease, diabetes mellitus, and obesity, all of which remain highly prevalent worldwide [3; 4; 6; 17].

Sex-specific analyses revealed increasing incidence rates among both men and women, although the magnitude of change varied between regions. The largest increases were observed in Almaty region, suggesting that improvements in diagnosis and healthcare utilization may have contributed to increased case ascertainment. Similar sex-related differences in CHF epidemiology have been reported internationally, reflecting variations in cardiovascular risk profiles, healthcare-seeking behavior, and survival following cardiovascular events [17-19].

Comparison of mean annual epidemiological indicators between the pre-COVID-19 period and the COVID-19/post-COVID-19 period showed an increase in reported CHF incidence in both regions, accompanied by a decrease in mean mortality rates. In Almaty city, mean incidence increased by 33.0 %, while mean mortality decreased by 29.5 %. In Almaty region, mean incidence increased by 105.8 %, while mean mortality decreased by 29.0 %. These findings describe temporal changes observed during the COVID-19 and post-COVID-19 period and should not be interpreted as evidence of a causal effect of the COVID-19 pandemic [20-23].

Despite the increase in mortality observed during the post-pandemic period, long-term mortality trends between 2012 and 2025 showed an overall decline in both regions. Mortality decreased by 67.0 % in Almaty city and by 40.2 % in Almaty region over the study period. Although the present study cannot determine the underlying causes of this decline, the observed temporal pattern is consistent with previous reports describing improvements in cardiovascular care [24].

Forecast analyses suggest that the burden of CHF will continue to increase through 2030 in both regions. Both forecasting approaches indicated substantial growth in incident cases, particularly in Almaty region. However, mortality projections differ between models, with linear regression suggesting a gradual decline and the baseline stationary ARIMA (0,0,0) models indicating relatively stable mortality levels. These findings highlight the uncertainty inherent in long-term forecasting and underscore the need for continued surveillance and periodic reassessment of epidemiological trends [23].

The combination of increasing incidence and decreasing long-term mortality suggests that a growing number of individuals are living with CHF and requiring ongoing medical care [24]. This epidemiological transition has important implications for healthcare planning, emphasizing the need to strengthen primary healthcare services, improve secondary prevention strategies, enhance continuity of care, and expand community-based management programs. Particular attention should be given to Almaty region, where the increase in incidence was substantially greater than that observed in Almaty city.

Strengths and Limitations

This study has several important strengths. First, it is based on long-term population-level data covering a 14-year period (2012-2025), allowing for a robust assessment of temporal trends. Second, the analysis includes both incidence and mortality indicators across two distinct settings, urban and regional, providing a more comprehensive understanding of CHF burden. Third, the study incorporates gender-stratified analysis and pre- and post-COVID-19 comparisons, enhancing the clinical relevance of the findings. Finally, the use of complementary forecasting approaches (linear regression and ARIMA) allows for a more nuanced interpretation of future trends.

However, several limitations should be acknowledged. The use of aggregated data limits the ability to account for individual-level characteristics such as age distribution, comorbidities, treatment patterns, and disease severity. Ad-

ditionally, potential inconsistencies in statistical reporting and registration practices may have contributed to variability in the data across years, particularly in regional settings. The forecasting models did not include external predictors (e.g., socioeconomic factors, healthcare accessibility, or risk factor prevalence), which may affect the accuracy of projections. Furthermore, although the inclusion of Almaty region improves generalizability, the findings may still not fully represent other regions of Kazakhstan or different healthcare systems.

Conclusion

This study demonstrates a substantial increase in CHF incidence in both Almaty city and Almaty region between 2012 and 2025, accompanied by an overall decline in mortality. The increase in incidence was considerably more pronounced in Almaty region, highlighting potential regional differences in disease burden, healthcare access, and case detection. Although mortality decreased over the study period, the rising incidence indicates a growing population living with CHF and requiring long-term medical care. These findings underscore the importance of strengthening primary healthcare services, improving early detection and disease management, and implementing targeted prevention strategies, particularly in Almaty region. Continued surveillance and resource planning will be essential to address the increasing burden of CHF and improve long-term cardiovascular outcomes.

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СОЗЫЛМАЛЫ ЖҮРЕК ЖЕТКІЛІКСІЗДІГІНІҢ АУРУШАҢДЫҒЫ МЕН ӨЛІМ-ЖІТІМ КӨРСЕТКІШТЕРІНІҢ ӨЗГЕРУ ҮРДІСТЕР

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Аңдатпа

Өзектілігі. Созылмалы жүрек жеткіліксіздігі бүкіл әлемде қоғамдық денсаулық сақтаудың маңызды мәселелерінің бірі болып қала береді және аурушаңдықтың өсуімен және өлім-жітімнің жоғары деңгейімен сипатталады. COVID-19 және пост-COVID-19 кезеңдерімен байланысты эпидемиологиялық үрдістер мен өзгерістерді зерттеу денсаулық сақтау стратегияларын оңтайландыру үшін маңызды.

Мақсаты. Алматы қаласы мен Алматы облысындағы созылмалы жүрек жеткіліксіздігінен болатын аурушаңдық пен өлім-жітімнің COVID-19-ға дейінгі және COVID-19/ COVID-19-дан кейінгі кезеңдердегі динамикасын талдау, сондай-ақ 2030 жылға дейінгі болжамдық үрдістерді бағалау.

Материалдар мен әдістер. 2012-2025 жылдардағы ресми статистикалық деректер негізінде ретроспективті сипаттамалық-талдамалық зерттеу жүргізілді. Созылмалы жүрек жеткіліксіздігінен болатын аурушаңдық пен өлім-жітім көрсеткіштері жалпы популяцияда және жынысы бойынша талданды. Зерттеу кезеңі COVID-19-ға дейінгі (2012-2019 жж.) және COVID-19/COVID-19-дан кейінгі (2020-2025 жж.) кезеңдерге бөлінді. Абсолюттік және салыстырмалы өзгерістер есептеліп, уақыттық қатарларға талдау жүргізілді. Болжау сызықтық регрессия және ARIMA (0,0,0) модельдері арқылы жүзеге асырылды.

Нәтижелері. Созылмалы жүрек жеткіліксіздігінің аурушаңдығы екі өңірде де артты. Алматы қаласында аурушаңдық көрсеткіші 100 000 халыққа шаққанда 1217,3-тен 1552,2-ге дейін (+27,5 %) өсті, ал Алматы облысында 100 000 халыққа шаққанда 145,7-ден 755,1-ге дейін (+418,4 %) артты. Ең жоғары өсім 2019 жылдан кейін байқалды. Аурушаңдық екі жыныста да артты, алайда ер адамдар арасында өсу қарқыны жоғары болды. Зерттеу кезеңінде өлім-жітім екі өңірде де төмендеді. COVID-19-ға дейінгі кезең мен COVID-19/пост-COVID-19 кезеңдерін салыстыру екі өңірде де аурушаңдық көрсеткіштерінің жоғарылағанын, ал өлім-жітімнің орташа көрсеткіштерінің төмендегенін көрсетті. Болжам нәтижелері 2030 жылға дейін аурушаңдықтың одан әрі өсуін, ал өлім-жітім деңгейінің салыстырмалы түрде тұрақты немесе біртіндеп төмендеуін көрсетеді.

Қорытынды. Зерттеу созылмалы жүрек жеткіліксіздігінің, әсіресе Алматы облысында, аурушаңдықтың артуы және өлім-жітімнің төмендеуімен сипатталатын жүктемесінің өсіп келе жатқанын көрсетті. Алынған нәтижелер, әсіресе өңірлік денсаулық сақтау деңгейінде, созылмалы жүрек жеткіліксіздігін ерте анықтау, профилактикалық іс-шараларды күшейту және пациенттерді ұзақ мерзімді басқару қажеттілігін айқындайды.

Түйін сөздер: *созылмалы жүрек жеткіліксіздігі, жүрек-қантамыр аурулары, эпидемиология, COVID-19, болжау, қоғамдық денсаулық сақтау, Қазақстан.*

ИЗМЕНЕНИЕ ТЕНДЕНЦИЙ ЗАБОЛЕВАЕМОСТИ И СМЕРТНОСТИ ОТ ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ

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Аннотация

Актуальность. Хроническая сердечная недостаточность остается одной из важнейших проблем общественного здравоохранения во всем мире, характеризуется ростом заболеваемости, а также высокой распространенностью, заболеваемостью и смертностью. Изучение эпидемиологических тенденций и изминений, связанных с периодами COVID-19 и после COVID-19, имеет важное значение для оптимизации стратегий здравоохранения.

Цель. Проанализировать динамику заболеваемости и смертности от хронической сердечной недостаточности в городе Алматы и Алматинской области в до- и в период COVID-19/после COVID-19, а также оценить прогнозные тенденции до 2030 года.

Материалы и методы. Проведено ретроспективное описательно-аналитическое исследование с использованием официальных статистических данных за 2012-2025 гг. Показатели заболеваемости и смертности от хронической сердечной недостаточности были проанализированы в общей популяции и по полу. Период исследования был разделен на доковидный (2012-2019 гг.) и период COVID-19/после COVID-19 (2020-2025 гг.) этапы. Рассчитывались абсолютные и относительные изменения, проводился анализ временных рядов. Прогнозирование осуществлялось с использованием линейной регрессии и моделей ARIMA (0,0,0).

Результаты. В обоих регионах возросла заболеваемость хронической сердечной недостаточностью. В городе Алматы уровень заболеваемости хронической сердечной недостаточностью увеличился с 1 217,3 до 1 552,2 на 100 000 населения (+27,5 %), в то время как в Алматинской области он увеличился с 145,7 до 755,1 на 100 000 населения (+418,4 %). Наиболее выраженный рост отмечался после 2019 года. Заболеваемость увеличилась среди лиц обоего пола, причем более высокие темпы роста наблюдались у мужчин. За исследуемый период смертность снизилась в обоих регионах. Сравнение доковидного периода с периодом COVID-19/после COVID-19 показало более высокие показатели заболеваемости в обоих регионах, тогда как средние показатели смертности снизились. Прогнозирование свидетельствует о дальнейшем росте заболеваемости до 2030 года при относительно стабильном или постепенно снижающемся уровне смертности.

Заключение. Исследование демонстрирует возрастающее бремя хронической сердечной недостаточности, особенно в Алматинской области, характеризующееся увеличением заболеваемости и снижением смертности. Полученные результаты подчеркивают необходимость усиления раннего выявления, профилактических мероприятий и долгосрочного ведения пациентов с хронической сердечной недостаточностью, особенно на региональном уровне системы здравоохранения.

Ключевые слова: *хроническая сердечная недостаточность, сердечно-сосудистые заболевания, эпидемиология, COVID-19, прогнозирование, общественное здравоохранение, Казахстан.*

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