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EPIDEMIOLOGY, RESOURCE DISTRIBUTION, AND MANAGEMENT CHALLENGES OF CHRONIC HEART FAILURE IN KAZAKHSTAN: A NATIONAL RETROSPECTIVE ANALYSIS

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Abstract

Background. Chronic heart failure is a growing global health challenge, particularly in Kazakhstan, where demographic changes and rising numbers of comorbidities are worsening the burden. However, data on CHF prevalence, diagnosis and healthcare resource distribution in the regions remain limited.

This study **aims** to assess and compare the epidemiological trends, regional disparities and healthcare system capacity of CHF in Kazakhstan based on recent national data.

Materials and methods. A retrospective analysis was conducted using national healthcare records from 2023–2024, including chronic heart failure prevalence, new diagnoses, stage distribution, regional healthcare resources and surgical interventions of patients. The Gini index was used to evaluate regional disparities, along with other statistical analyses.

Results. In 2024, 87,260 patients were examined, with a 19% increase from 2023. Of 12,874 new cases, 75.6% were identified in early stages (A and B), suggesting progress in early detection. However, regional disparities were severe, with Gini indices for ProBNP testing and echocardiography at 0.556 and 0.480, respectively. High-resource areas like Almaty contrasted sharply with under-resourced regions such as Mangystau and Kyzylorda wtih heart transplants being declined, while LVAD usage increasing which reflects evolving treatment patterns amid limited donor availability.

Conclusion. Chronic heart failure is increasing in Kazakhstan amid significant regional and systemic inequalities in care. Targeted interventions with improved diagnostic access, equitable resource allocation, and national policy reform are urgently needed to manage the growing burden and improve outcomes of patients across the country.

Key words: *chronic heart failure, epidemiology, health resource distribution, healthcare inequality*.

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Резюме

ПРОБЛЕМЫ ЭПИДЕМИОЛОГИИ, РАСПРЕДЕЛЕНИЯ РЕСУРСОВ И УПРАВЛЕНИЯ ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТЬЮ В КАЗАХСТАНЕ: НАЦИОНАЛЬНЫЙ РЕТРОСПЕКТИВНЫЙ АНАЛИЗ

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Введение. Хроническая сердечная недостаточность становится растущей проблемой общественного здравоохранения во всем мире, особенно в Казахстане, где демографические изменения и рост сопутствующих заболеваний усугубляют бремя. Однако данные о распространенности ХСН, диагностике и распределении ресурсов здравоохранения в регионе остаются ограниченными.

Цель. Оценка эпидемиологических тенденций, географических различий и возможностей системы здравоохранения, связанных с ХСН в Казахстане, на основе последних национальных данных.

Материалы и методы. Ретроспективный анализ проводился с использованием национальных записей здравоохранения за 2023–2024 годы. Данные включали распространенность ХСН, новые диагнозы, распределение стадий, региональные ресурсы здравоохранения и хирургические вмешательства. Для оценки региональных различий использовались показатели неравенства, такие как индекс Джини.

Результаты. В 2024 году было обследовано 87 260 пациентов с ХСН, что на 19% больше, чем в 2023 году. Из 12 874 новых случаев 75,6% были выявлены на ранних стадиях (A и B), что свидетельствует о прогрессе в раннем выявлении. Однако региональные различия в лечении были резкими: индексы Джини для тестирования ProBNP и эхокардиографии составили 0,556 и 0,480 соответственно. Регионы с высоким уровнем ресурсов, такие как Алматы, резко контрастировали с регионами с низким уровнем ресурсов, такими как Мангистауская и Кызылординская области. Количество трансплантаций сердца сократилось, в то время как использование LVAD увеличилось, что отражает меняющиеся модели лечения на фоне ограниченного количества доноров.

Заключение. ХСН растет в Казахстане на фоне значительного регионального и системного неравенства в лечении. Целевые вмешательства — улучшение диагностического доступа, справедливое распределение ресурсов и реформа национальной политики — срочно необходимы для управления растущим бременем и улучшения результатов по всей стране.

***Ключевые слова**: хроническая сердечная недостаточность, эпидемиология, распределение ресурсов здравоохранения, неравенство в здравоохранении.*

Для цитирования:

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Түйіндеме

ҚАЗАҚСТАНДАҒЫ СОЗЫЛМАЛЫ ЖҮРЕК ЖЕТКІЛІКСІЗДІГІНІҢ ЭПИДЕМИОЛОГИЯСЫ, РЕСУРСТАРЫН БӨЛУ ЖӘНЕ БАСҚАРУ МӘСЕЛЕЛЕРІ: ҰЛТТЫҚ РЕТРОСПЕКТИВТІ ТАЛДАУ

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Кіріспе. Созылмалы жүрек жеткіліксіздігі бүкіл әлемде, әсіресе демографиялық өзгерістер мен қатар жүретін аурулардың өсуі ауыртпалықты күшейтетін Қазақстанда қоғамдық денсаулықты алаңдатып отыр. Дегенмен, аймақта аурудың таралуы, диагностикасы және денсаулық сақтау ресурстарын бөлу туралы деректер шектеулі болып қала береді.

Мақсаты. Бұл зерттеу соңғы ұлттық деректер негізінде Қазақстандағы жүрек жеткіліксіздігіне байланысты эпидемиологиялық үрдістерді, географиялық теңсіздіктерді және денсаулық сақтау жүйесінің әлеуетін бағалауға бағытталған.

Материалдар мен әдістері. 2023-2024 жылдар аралығындағы ұлттық денсаулық сақтау жазбалары арқылы ретроспективті талдау жүргізілді. Деректер жүрек жеткіліксіздігінің таралуын, жаңа диагноздарды, кезеңді бөлуді, аймақтық денсаулық сақтау ресурстарын және хирургиялық араласуды қамтиды. Аймақтық теңсіздіктерді бағалау үшін Джини индексі сияқты теңсіздік көрсеткіштері пайдаланылды.

Нәтижелер. 2024 жылы жүрек жеткіліксіздікпен ауыратын 87 260 науқас бағаланды, бұл 2023 жылмен салыстырғанда 19%-ға өсті. 12 874 жаңа жағдайдың 75,6%-ы ерте кезеңдерінде (A және B) анықталды, бұл ерте анықтаудағы прогресті көрсетеді. Дегенмен, күтімдегі аймақтық диспропорциялар қатты болды, ProBNP сынағы мен эхокардиографияға арналған Джини индекстері сәйкесінше 0,556 және 0,480 болды. Алматы сияқты ресурстары жоғары аудандар Маңғыстау және Қызылорда сияқты ресурстары аз аймақтармен күрт қарама-қайшы болды. Жүректі трансплантациялау азайды, ал LVAD қолдану өсті, бұл донорлардың шектеулі қолжетімділігі жағдайында дамып келе жатқан емдеу үлгілерін көрсетеді.

Қорытынды. Созылмалы жүрек жеткіліксіздігі Қазақстанда медициналық көмек көрсетудегі елеулі аймақтық және жүйелік теңсіздік жағдайында өсуде. Мақсатты араласулар — диагностикалық қолжетімділікті жақсарту, ресурстарды тең бөлу және ұлттық саясатты реформалау — өсіп келе жатқан ауыртпалықты басқару және бүкіл ел бойынша нәтижелерді жақсарту үшін шұғыл қажет.

***Түйінді сөздер**: созылмалы жүрек жеткіліксіздігі, эпидемиология, денсаулық сақтау ресурстарын бөлу, денсаулық сақтау саласындағы теңсіздік*

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Introduction

Chronic heart failure (CHF) is a multifaceted clinical syndrome characterized by the heart's inability to meet the body's circulatory demands [8]. Its heterogeneity in etiology and presentation complicates accurate epidemiological assessment and healthcare planning [5]. The disease being a significant cause of morbidity and mortality both in Kazakhstan and worldwide, CHF represents a critical public health issue and poses unique challenges in Kazakhstan due to its demographic and healthcare dynamics.

In Kazakhstan, as in other countries globally, the burden of CHF is rising due to an aging population, increasing prevalence of cardiovascular risk factors such as hypertension, diabetes, and obesity and the growing transition to more sedentary lifestyles [4, 13]. Recent global estimates indicate a CHF prevalence of 1–2% among the general adult population, increasing sharply to 11.8% among those aged 65 years and older [6, 7]. These numbers likely reflect similar trends in Kazakhstan, where the growing burden of multimorbidity worsens healthcare challenges.

Accurate data on CHF patients in Kazakhstan remains limited, mirroring the broader gap in disease epidemiological insights across Central Asia countries. However, global studies suggest that populations in lower- and middle-income countries, including Kazakhstan, may face unique risks due to the double burden of non-communicable diseases (NCDs) and infectious diseases which is of particular interest to further investigation [19]. The socioeconomic disparities prevalent in the country is further being impacted with individuals from less affluent backgrounds experiencing earlier onset and higher comorbidity burdens.

Kazakhstan has experienced a notable increase in the prevalence of CHF, with 4.7% of the population, approximately 320,000 people, diagnosed with this condition [18]. Between 2014 and 2021, the total number of patients diagnosed with CHF had risen to 501,663. Also, there was a significant increase in prevalence from 4,393 to 22,088 per million population [20]. The burden is further highlighted by the increaing mortality rates, which escalated from 367 to 721 per million during the same time period. Regional data indicate the highest cardiovascular disease incidence in Almaty, accounting for 4% of cases [1].

According to the statistical collection "Health of the population of the Republic of Kazakhstan and the activities of healthcare organizations in 2022-2023", the mortality burden of the different diseases associated with cardiovascular systems account for 128.92 and 126.50 people for 100 000 people in 2022 and 2023 respectively [14]. The statistical data shows the significant difference in mortality rates, compared to malignant and benign tumors, diseases of the digestive system, lungs, infectious or parasitic diseases, traumas and poisoning with the cardiovascular diseases illustrating the highest mortality rate in Kazakhstan. Contributing factors to the mortality rate of CHF include mainly arterial hypertension, coronary heart disease, chronic kidney disease and other comorbidities. However, one more contributing factor is the disparity in CHF coding and classification, as well as the challenge in recognizing CHF as

a primary cause of mortality which further complicates accurate data representation. This growing challenge emphasizes the need for enhanced cardiac care and preventive measures across the country, as well as improved diagnostics.

In addition to the existing challenges faced by patients with chronic heart failure, barriers to effective self-management represent a significant obstacle. Common issues include a lack of understanding about the named disease and its treatment, psychological distress such as anxiety or depression, and difficulties practicing the complex dietary and medication regimens. Physical limitations of patients and their conditions, as well as general limited access to rehabilitation further compound these challenges. Addressing them requires targeted interventions, such as patient educational programs to enhance disease awareness. Also, it is possible to implement structured support systems for managing dietary, medication compliance and accessible mental health counseling. Furthermore, personalized exercise and rehabilitation programs can encourage patients with CHF to maintain physical activity levels appropriate to their condition. By identifying and mitigating these obstacles, healthcare providers can improve patients' ability to manage CHF effectively, thereby enhancing their quality of life and reducing hospital readmissions [11].

Heart transplantation remains the gold-standard treatment for end-stage heart failure that is opposite to medical therapy. However, it is accessible to only a limited number of patients globally, including in Kazakhstan, due to various challenges such as the remoteness of specialized cardiac surgery centers, a persistently growing number of patients awaiting transplants, a low supply of donor hearts and a lack of motivation within the population to participate in organ donation. Consequently, patients often have to wait for suitable donors, further complicating their worsening condition. The urgent need for alternative treatment strategies and improved organ donation policies in future is required [2, 16].

Furthermore, CHF subtypes such as heart failure with preserved ejection fraction (HFpEF) are showing clearer prominence due to their association with aging and obesity-related conditions which are both rising in Kazakhstan [14, 15].

This study provides insights into the CHF's prevalence, risk factors and demographic disparities. By focusing on Kazakhstan, this research emphasizes the need to implement public health strategies tailored to the region's unique epidemiology and diagnostic tools which will contribute to more effective healthcare interventions and policy planning.

Materials and methods

This study is a retrospective epidemiological research to evaluate the burden, trends, and healthcare resource distribution data related to chronic heart failure in Kazakhstan. The research focuses on estimating CHF prevalence, incidence, disease progression, regional distribution, healthcare infrastructure and treatment patterns based on national healthcare system data collected over a 12-month period in 2024 which includes data from 2023 for comparison purposes. Diagnostic and treatment comparisons in the paper analyze variations in echocardiograms, NT-proBNP testing, and advanced interventions (LVAD, ICD, CRT-D, transplantation). The study also evaluates healthcare system capacities which includes in itself the distribution of CHF-specialized facilities and specialists.

For 2024, a total of 326 offices of chronic heart failure management are functioning within different regional and city cardiology centers, multidisciplinary hospitals and outpatient clinics across the whole Kazakhstan. These offices offer specialized care for patients with CHF, diagnostic tools, condition monitoring and treatment selection. In CHF offices, patients receive care from cardiologists, therapists, and general practitioners. Over the course of 2024, a total of 87 260 patients with chronic heart failure were examined on an outpatient basis, compared to 73,082 in 2023. Among these, 12 874 cases were newly diagnosed (12,393 in 2023). The distribution of newly identified cases by stage is as follows:

- Stage A (CHF risk) – 3 943 cases
- Stage B – 5 800 cases
- Stage C (symptomatic CHF) – 2 875 cases
- Stage D (progressive CHF) – 256 cases.

Statistical analysis

Descriptive statistics were used to assess and compare CHF prevalence and regional distributions of patients. Inequality in healthcare resource allocation was evaluated and statistically analyzed using Gini, Theil and concentration indices. Lorenz curves illustrated disparities in diagnostic access of the disease across cabinets in Kazakhstan. A generalized linear model with negative binomial regression was applied to identify factors associated with new CHF diagnoses, if possible. Multicollinearity was assessed using VIF and overdispersion was confirmed prior to model selection.

Ethical approval

This study is based on de-identified and anonymous, aggregated healthcare data and does not involve direct patient interactions or their personal information. Ethical approval (2023/01-009) was obtained from institutional review board and all the analyses were conducted in compliance with national data protection regulations.

Results

Prevalence and Incidence of CHF

In 2024, a total of 87,260 patients with CHF were examined on an outpatient basis across Kazakhstan, marking an increase from 73,082 in 2023. Among these, 12,874 new cases of CHF were diagnosed in 2024, compared to 12,393 in 2023 as illustrated in Figure 1. The distribution of these newly diagnosed cases by stage is as follows: 3,943 in Stage A (CHF risk), 5,800 in Stage B, 2,875 in Stage C (symptomatic CHF), and 256 in Stage D (progressive CHF).

Regional Distribution of CHF Cases

The distribution of CHF cases by stage across different regions of Kazakhstan reveals notable regional disparities as shown in Table 1. The highest number of outpatients was recorded in Almaty (21,046), followed by Pavlodar (12,473) and Shymkent city (6,212). The proportion of patients diagnosed with Stage A and Stage B CHF was more significant in regions with larger urban populations, such as Almaty and Shymkent, indicating a higher prevalence in metropolitan areas. Conversely, rural regions like Mangystau and Kyzylorda exhibited lower numbers of cases and fewer cases in advanced stages of CHF.

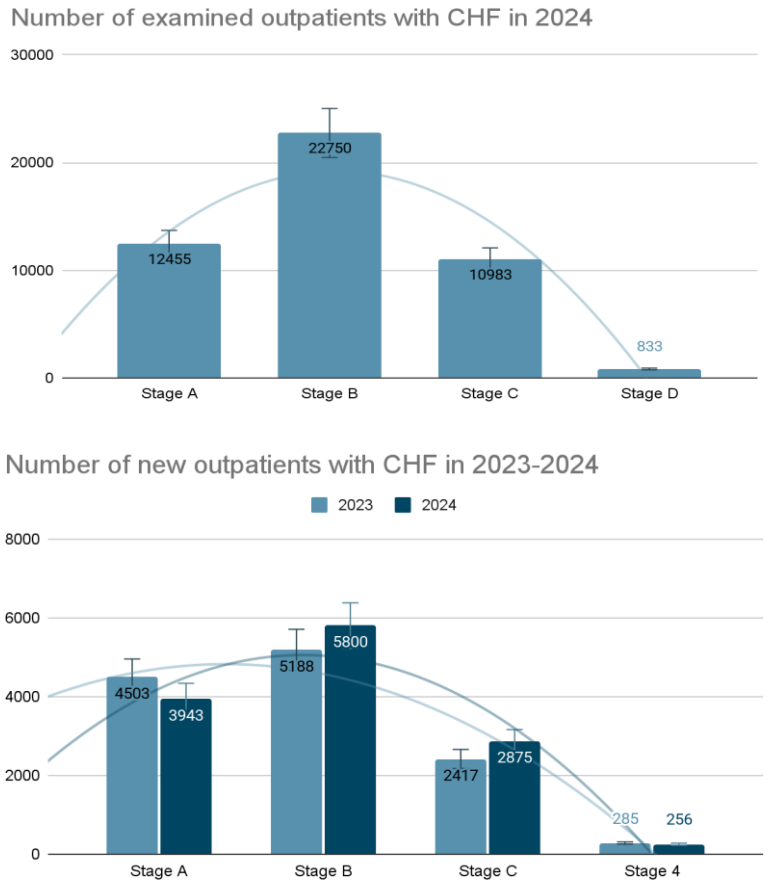

Figure 1. A: Number of examined outpatients with CHF in 2024.
B: Number of new outpatients with CHF in 2023-2024.

Table 1.

Distribution of outpatients in different regions of the Kazakhstan.

Region	Stage A	Stage B	Stage C	Stage D	Total number of examined outpatients
Abay	205	322	137	11	1107
Akmola	84	150	83	12	931
Aktobe	147	516	184	3	1615
Jetisu	313	417	290	9	1443
Almaty	564	1637	303	7	3430
Atyrau	69	677	1124	**151**	3195
East Kazakhstan	243	1649	406	4	3239
Zhambyl	**2032**	1196	530	50	6788
West Kazakhstan	177	1009	621	97	3661
Karagandy	333	868	401	13	6032
Kostanay	1041	761	963	63	3151
Kyzylorda	108	451	229	9	2191
Mangystau	38	105	162	19	502
Pavlodar	1023	4012	**1136**	93	**12473**
North Kazakhstan	659	**2792**	603	42	6414
Turkestan	72	228	350	23	1656
Shymkent city	2278	1570	678	130	6212
Almaty city	*2957*	3882	2526	79	*21046*
Astana city	112	508	257	18	1904

Surgical Interventions for CHF

Surgical treatments for CHF, including heart transplantation, Left Ventricular Assist Devices (LVAD), and implantable devices, have increased in recent years. In 2024, there was a notable rise in the number of patients receiving LVADs (27 in 2024 vs. 13 in 2023), while the number of heart transplants decreased (8 in 2024 vs. 21 in 2023) as stated in Table 2. The increase in LVADs reflects advancements in treatment options for end-stage heart failure, whereas the decline in heart transplants could be attributed to the limited availability of suitable donor organs.

Table 2.

Number of patients, referred for surgical treatment of CHF.

Surgical treatment	2023	2024
Heart transplantation	21	8
LVAD	13	27
Implantable cardioverter-defibrillator	380	406
CRTD	92	140

Regional Inequalities in CHF Resources

The distribution of healthcare resources related to CHF, such as CHF-specialized cabinets, cardiologists, and diagnostic tests (e.g., ProBNP tests, echocardiograms) shows significant regional inequality. The Gini index values for CHF cabinets (0.283), cardiologists (0.315), and total specialists (0.317) suggest moderate levels of inequality in resource distribution across Kazakhstan. Diagnostic resources exhibit even more significant disparities, with the Gini index for ProBNP tests reaching 0.556 and for echocardiograms 0.480 as shown in Figure 2. This highlights the unequal availability of diagnostic capabilities, impacting the quality of care in less resource-rich regions.

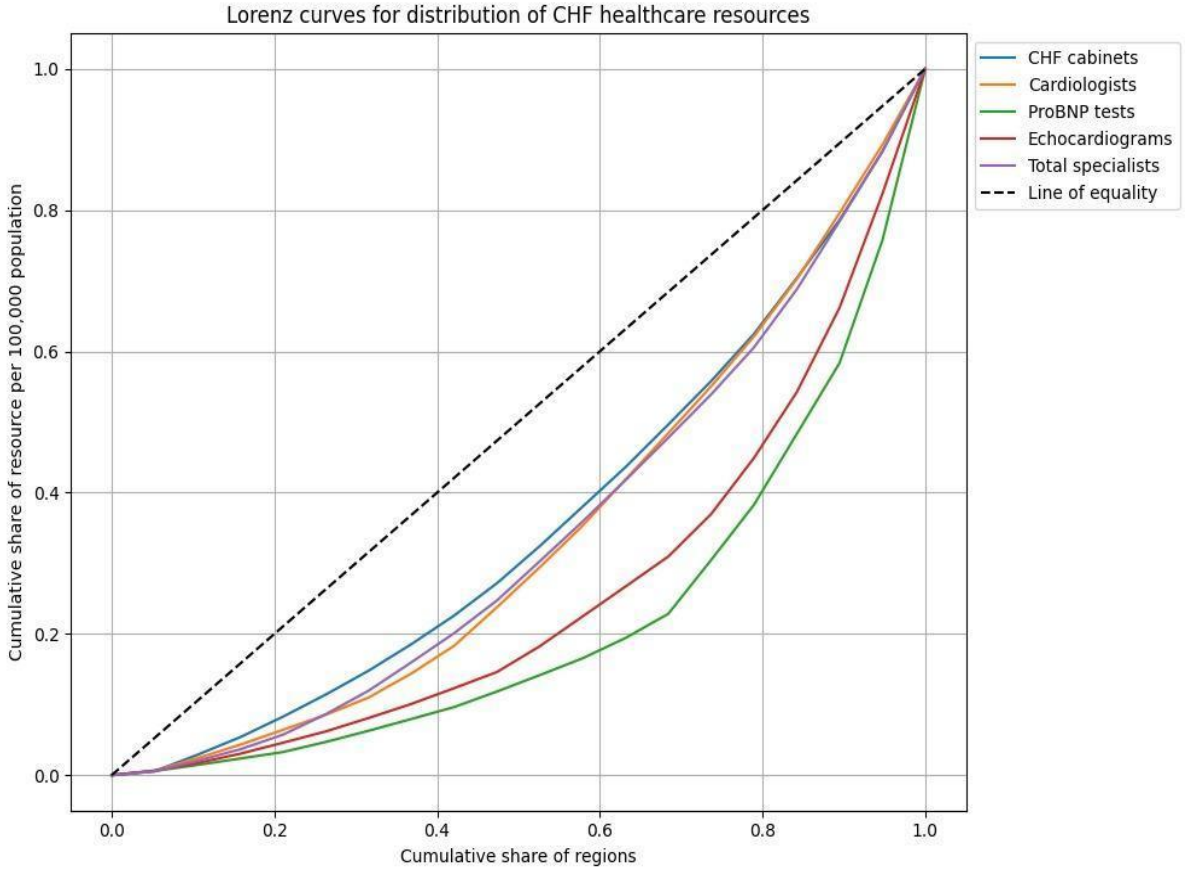

Figure 2. Lorenz curves for CHF resources (per 100,000 adult population).

Table 3.

Summary table of inequality metrics (normalized per 100,000 people).

Metric	Gini Index	Theil Index	Concentration index
CHF cabinets	0.283223	0.133656	-1.108772
Total specialists	0.316630	0.167422	-1.192982
Cardiologists	0.314568	0.165891	-1.108772
ProBNP tests	0.555502	0.541351	-1.389474
Echocardiograms	0.479690	0.382255	-1.463158

Contribution of Regions to Inequality in CHF Resources

Analysis of regional contributions to resource inequality reveals that regions with both an excess and a deficit of CHF-related resources contribute to overall inequality. For example, regions such as West Kazakhstan and Pavlodar show an overconcentration of resources, whereas Astana and East Kazakhstan region experience significant shortages. These imbalances indicate the need for targeted redistribution of resources to ensure more equitable access to CHF care across the country (Figure 3).

Factors Associated with CHF Diagnosis

A generalized linear regression model was applied to assess factors associated with new CHF diagnoses across regions. The results suggest a weak but positive relationship between the number of CHF-specialized cabinets and the number of new CHF cases, though this association was not statistically significant ($p = 0.250$). A marginally significant positive correlation was observed between the number of echocardiograms performed and the detection of new CHF cases (OR = 0.0017, $p = 0.068$), suggesting that greater availability of echocardiography could lead to higher rates of diagnosis (Table 4).

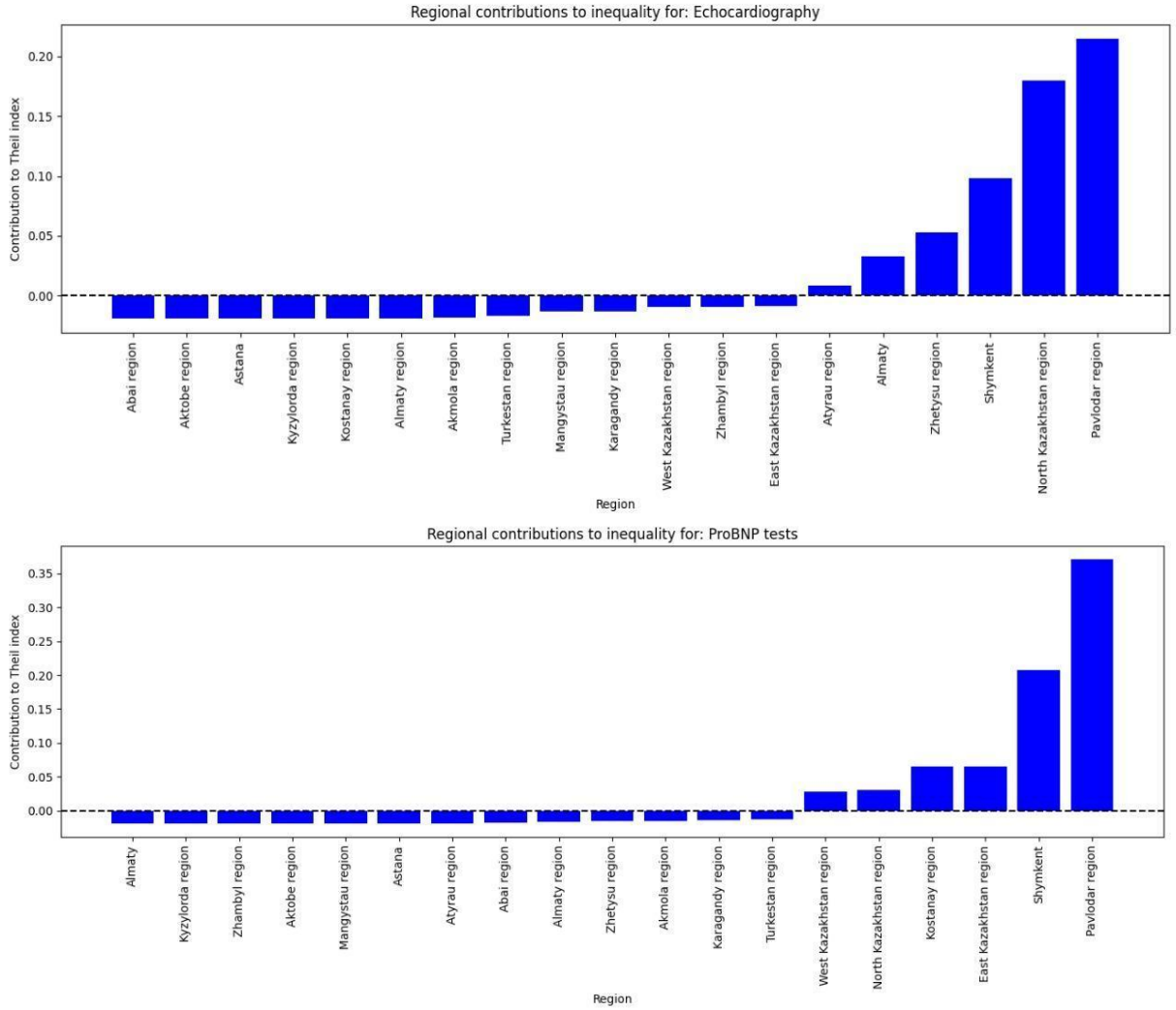

Figure 3. Inequality graphs of echocardiography and ProBNP tests.

Table 4.

Generalized linear regression model.

Characteristics	OR [CI 95%]	p value
Intercept	-8.3566 [-9.962; -6.751]	0.000
CHF cabinets (per 100 000)	0.2763 [-0.195; 0.747]	0.250
Cardiologist (per cabinet)	0.0958 [-1.217; 1.409]	0.886
ProBNP tests (per 100 000)	-0.0008 [-0.0006; 0.0005]	0.764
Echocardiogram (per 100 000)	0.0017 [-0.0000; 0.0004]	0.068

Discussion

Driven by an aging population, increasing rates of hypertension, diabetes and poor lifestyles, chronic heart failure is becoming a more serious health problem in Kazakhstan. Though advances in cardiac care have been made, the number of CHF cases has grown dramatically in recent years, stressing the healthcare system and underdiagnosing CHF, particularly in rural areas with restricted access to specialists and diagnostic tools. Many patients have several diseases as well, which complicates therapy.

Though access stays inconsistent, advanced treatments such torasemide and cardiac resynchronization therapy have shown encouraging outcomes. Public knowledge is poor; rehabilitation services and preventive care are insufficient. Kazakhstan has to plan concentrating on early detection, improved access to treatment, enhanced patient education, and funding of digital and community-based health solutions in order to meet these difficulties.

The results of this study confirm the increasing load of CHF in Kazakhstan, therefore highlighting epidemiological patterns and systematic deficiencies. The year-on-year rise in the number of examined CHF outpatients—from 73,082 in 2023 to 87,260 in 2024—along with a growing incidence rate, suggests an intensifying public health issue. The growing prevalence might indicate a real rise in disease incidence as well as better detection efforts, probably motivated by demographic changes, lifestyle choices, and the growing load of comorbid diseases like hypertension, diabetes, and chronic kidney disease linked to higher death rates.

The stage-wise distribution of newly diagnosed cases with a significant proportion falling into Stage A (30.6%) and Stage B (45.0%) may suggest some effectiveness in early identification. However, the persistence of symptomatic and

progressive stages (Stages C and D totaling over 24%) highlights the need for more proactive screening and patient follow-up procedures.

Significant regional differences in the number of CHF cases—most notably in Almaty, Pavlodar, and Shymkent—showcase potential inequalities in diagnostic capacity as well as urban-centric healthcare access. In contrast, areas like Mangystau and Kyzylorda reported much fewer cases, which might be due more to a lack of adequate healthcare facilities than to a real decline in the disease challenge. Moderate inequality (Gini indices of 0.283 and 0.315, respectively) is also evident in the distribution of cardiologists and cabinets with expertise in CHF. This result supports policy-level initiatives to decentralize cardiac care and is in line with past research showing Kazakhstan's healthcare system is highly centralized. It should be noted that the first CHF room was opened in 2014 at the National Cardiac Surgery Research Center in Astana in connection with the introduction of LVAD technologies, but in the regions, CHF rooms began operating in 2022, 119 rooms immediately began operating in the regions in connection with the implementation of the roadmap of the Ministry of Health of the Republic of Kazakhstan; as of 2025, 326 rooms were already functioning. This time gap further highlights the inequality in resource distribution in the organization of CHF care. In general, inequality in health resource distribution has been identified as a global public health priority, but geographic variations and temporal trends in distribution and inequality in Kazakhstan remain unclear.

The imbalance is more pronounced with regard to diagnostic testing. The high Gini index values for ProBNP tests (0.556) and echocardiography (0.480) illustrate unequal access to essential diagnostic tools which are critical for confirming CHF diagnoses and guiding treatment. Importantly, this diagnostic inequality likely contributes to delayed or missed diagnoses, further worsening disease progression and increasing the burden on tertiary care facilities.

Surgical and device-based treatments for CHF, such as LVAD implantation and CRT-D therapy, have shown incremental increases. However, the sharp decline in heart transplants—from 21 in 2023 to only 8 in 2024 - raises concern. This trend may be attributed to systemic limitations in donor availability, logistic barriers in organ allocation, or insufficient public engagement in organ donation. The observed growth in LVAD usage suggests a gradual shift towards mechanical circulatory support as a more accessible treatment. These data highlight the evolving therapeutic landscape and the necessity for continued investment in high-complexity cardiac interventions.

The generalized linear regression analysis exploring factors associated with new CHF diagnosis revealed a weak, statistically non-significant correlation between the number of CHF-specialized cabinets and newly diagnosed cases ($p = 0.250$). While not conclusive, this may suggest that merely increasing physical infrastructure without enhancing care quality, staffing, and diagnostic reach may not translate into improved case identification. The modest association between echocardiography rates and new diagnoses ($p = 0.068$) was closer to significance, supporting the notion that greater diagnostic capacity can contribute to earlier detection. However, this signal remains tentative and warrants cautious interpretation.

The limitations of this research study are firstly, the fairly low significance levels probably indicate unmeasured confounding variables such provider experience, patient education, and local healthcare-seeking behaviors. Second, aggregated regional data could hide intra-regional differences. These constraints imply that although infrastructure and diagnostics are important, tackling CHF in Kazakhstan calls for a more integrated approach including community-based care, public education, and workforce training.

All things considered, the findings point to a thorough, equitable national plan. It is crucial to strengthen early diagnostic networks, guarantee fair distribution of cardiology resources, increase advanced treatments, and broaden public awareness campaigns. Furthermore, regional CHF registries' growth and use of digital health tools could improve monitoring and guide tailored interventions.

Conclusion

This study is the first to describe temporal and geographic differences in resource allocation in organizational care for the diagnosis and treatment of CHF, despite sample limitations. The effectiveness of diagnostic and treatment services is impacted by disparities in financial and organizational strategies, as well as temporal and geographic variations, which lead to unequal resource allocation. To effectively reduce inequalities and allocate resources, it is crucial to draw in administrative support, investment, and the appropriate strategy.

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