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Characteristics of High-Cost Beneficiaries of Prescription Drugs in Kazakhstan: A Cross-Sectional Study of Outpatient Data from 2022

Adilet Nazarbayev[1], Ardak Nurbakyt[1], Bibigul Omirbayeva[2], Anuar Akhmetzhan[1], Lyazzat Kosherbayeva[1,3]

[1]Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan; [2]Salidat Kairbekova National Research Center for Health Development, Astana, Kazakhstan; [3]Al-Farabi Kazakh National University, Almaty, Kazakhstan

Correspondence: Anuar Akhmetzhan, Asfendiyarov Kazakh National Medical University, 88 Tole bi Street, Almaty, Kazakhstan, Email anuar.akh@bk.ru

Background and Objectives: Limited information is available regarding the distribution of increasing pharmaceutical expenditures within large representative samples of national populations globally. The aim was to investigate the distribution of pharmaceutical costs in outpatient treatment and analyze the primary characteristics of users of expensive drugs within the healthcare system of Kazakhstan.

Methods: This study utilized data from the Information System for Outpatient Drug Supply, which includes nationally representative data from all regions of Kazakhstan, covering both rural and urban populations. The key explanatory variables in this study included age, gender, number of prescribed medications, disease categories based on ICD-10 codes, and insurance coverage status. These variables were selected to capture demographic, clinical, and healthcare access factors influencing prescription drug costs. In total, 2.2 million people, who were prescribed outpatient medications were included. High-cost users (HCUs) were characterized as individuals whose prescription drug expenses ranked within the highest 5%.

Results: The distribution of pharmaceutical costs exhibits significant discrepancy, with 5% of the population receiving prescription drugs covered by the state budget and social medical insurance fund contributing to nearly three-quarters of all costs. Notably, these HCUs tended to be younger than low-cost drug users. HCUs, on average, consumed a greater quantity of medications compared to non-HCUs. Among children, the top diseases contributing to high costs were rare hereditary diseases and malignancies, while in adults, cancer and diabetes were the primary cost drivers.

Conclusion: There is a concentration of public drug program spending within a small percentage of beneficiaries with high drug costs in Kazakhstan. This discovery offers valuable insights for shaping policies tailored to this specific population, aiming to mitigate escalating costs and enhance the optimal use of medications.

Plain Language Summary: The pronounced skewness in the consumption of reimbursed outpatient drugs within the healthcare system of the Republic of Kazakhstan highlights the need for targeted cost containment strategies, in addition to broader measures such as price regulation and adjustments to reimbursement lists that impact the general population.

The highest average costs in the high-cost group are observed in children under 5 years of age. Costs associated with chronic diseases (diabetes and others) rank in the top three, while when assessing costs in the high-cost user group, rare inherited diseases and cancer have a significant impact.

Keywords: Pharmaceutical Expenditure, Prescription Drugs, Cost Distribution, Medicine user, High-cost patients

Introduction

Within the framework of universal health coverage, many countries have supported the implementation of policies to ensure accessible and quality health care, encompassing both medical treatment and pharmaceutical provision.[1,2] The

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delivery of medicines to the population stands as a critical pillar within the broader framework of healthcare, exerting a significant influence on the overall well-being of society members. The extent to which the populace's pharmaceutical needs are met plays a pivotal role in determining the health levels of individuals and, ultimately, the duration and quality of their lives.

On the other hand, drug costs are one of the fastest-growing cost items in the healthcare system of the Republic of Kazakhstan.[3,4] This escalation can be explained by rising global drug prices, along with the introduction of new medications and the development of medical guidelines to address morbidity in older age groups. Additionally, improved diagnostic methods for detecting rare and serious diseases in pediatric patients contribute to the increasing costs. To curb the growth of pharmaceutical costs, the country is pursuing a policy of state regulation of drug prices.

Globally, a small percentage of healthcare users are responsible for a disproportionate share of healthcare costs. Studies from Western countries such as Canada, Finland and the United States etc. indicate that 5% of patients account for over half of healthcare expenditures, particularly in the realm of pharmaceutical spending.[5–7] This phenomenon highlights the importance of studying high-cost users (HCUs) in various healthcare systems to understand the underlying drivers of cost concentration. In the US, for example, research has shown that HCUs often have chronic conditions such as diabetes, cardiovascular disease, and cancer, which contribute to high prescription drug use.[8,9] Similar findings have been observed in Europe, where polypharmacy among elderly populations has also been a significant cost factor.[5,10]

Kazakhstan's healthcare system operates under a dual framework: the Statutory Free Medical Assistance (SFMA) and the Compulsory Social Health Insurance (CSHI).[11] This system shares similarities with countries like Germany and South Korea, where social insurance models also play a key role in healthcare provision. However, unlike many European countries that maintain comprehensive pharmaceutical coverage, out-of-pocket expenses for prescription drugs in Kazakhstan remain substantial, accounting for nearly three times the amount reimbursed through public funds.[12] In contrast, in countries like Canada,[5] public drug plans cover a higher proportion of pharmaceutical costs, even though high-cost users similarly drive a large share of expenses.

The SFMA is extended to residents within the Republic of Kazakhstan, including citizens, foreigners, and stateless individuals who have established permanent residency within the country's borders. The SFMA consists of specific healthcare services, including emergency medical care with the use of Medical Air Transport. Primary health care covers diagnostic, treatment, and preventive examinations, as well as sanitary-anti-epidemic and sanitary-preventive measures in infectious disease hotspots. Specialized outpatient medical care in Kazakhstan focuses on the prevention and diagnosis of infections like HIV and tuberculosis, as well as emergency services and treatment for socially significant and chronic diseases. The Kazakh Ministry of Health has established an official list of socially significant diseases, which includes conditions such as tuberculosis, HIV, chronic viral hepatitis, several types of cancers and rare diseases, among others. In hospital settings, the SFMA includes treatment for these critical conditions, home hospital services, and specialized care for infectious and parasitic diseases that pose a risk to public health. The provision of medications, medical devices, and immunobiological products is also part of the SFMA, aligning with diseases targeted by preventive vaccinations and specialized outpatient medical care. Individuals covered under Kazakhstan's compulsory social health insurance system benefit from a broader range of medical services tailored to their insurance status. This comprehensive approach ensures access to essential treatments and preventive measures for diseases that significantly impact public health, as defined by the Ministry. The funding structure for CSHI in Kazakhstan is diverse, reflecting contributions from various categories of individuals and the state. Employers allocate 3% of an employee's salary to the compulsory medical insurance fund, capped at ~$46, while employees, including those under service agreements, autonomously contribute 2% of their income, with a maximum limit of ~$30. Individual entrepreneurs and those engaged in private practice contribute 5% of 1.4 times the monthly calculation index (MCI) or ~$11. Informally self-employed citizens follow a tiered payment system, with residents of urban areas contributing 1 MCI (~$7.5) and rural residents contributing 0.5 MCI (~$3.8). Independent payers contribute 5% of the minimum wage, totaling ~$7.6. The state assumes the responsibility of covering the medical insurance for 15 preferential categories of citizens, encompassing over 11 million individuals. These categories include children, the unemployed, pregnant women, those on leave for childcare, caregivers of disabled individuals, pension recipients, veterans, persons serving sentences, individuals in pre-trial detention, non-working Ethnic Kazakh Returnees, mothers of many children, persons with disabilities, students in various educational

institutions, and unemployed recipients of state targeted social assistance. The annual contribution for one person within these categories is fixed at ~$9.8.

There exists a list of medications – a list of Outpatient Drug Provisions that qualify for reimbursement from both budgetary funds and the social health insurance fund. This list delineates the names and specifications of these healthcare items, specifically customized to accommodate individual benefit categories corresponding to citizens with certain diseases. The scope of this list pertains to outpatient medical care. The Ministry of Health (MoH) consistently conducts periodic reviews and approvals of this list to uphold its relevance and efficacy.

While previous studies have explored high-cost users in various countries, there is limited research on the distribution of pharmaceutical expenditures in Central Asia, particularly in Kazakhstan. This study provides a first-of-its-kind analysis of high-cost prescription drug users in Kazakhstan, offering insights into how rare diseases and chronic conditions contribute to national drug expenditure. By comparing Kazakhstan's findings with global trends, this study aims to inform policy decisions that could mitigate escalating healthcare costs and improve access to life-saving medications.

Methods

This was a descriptive retrospective study using data from the Information System for Drug Supply (ISLO) in 2022. The data included all prescriptions and dispensing of medications to patients across various healthcare settings under the SFMA and CSHI. The ISLO records encompass demographic characteristics, diagnoses, and details of pharmaceutical drugs and medical devices, including international nonproprietary names, trade names, quantities, prices, prescription and dispensing dates, and sources of funding. Medical conditions are classified according to the International Classification of Diseases, Tenth Revision (ICD-10).

The subjects of the analysis were patients eligible for SFMA and CSHI who received outpatient medications from pharmacies between January and December 2022. All costs were converted into US dollars using the weighted average exchange rate of 1 United States Dollar equals 460.48 Kazakhstani Tenge (2022).

In this study, the following key explanatory variables were selected:

1. Age: This variable helps identify how drug consumption and costs vary across different age groups, which is crucial for understanding healthcare needs.
2. Gender: Analysis of gender differences provides insights into how drug expenditures may differ based on demographic characteristics.
3. Number of Medications: This variable indicates the extent of polypharmacy among patients, which is linked to higher healthcare costs and potential health risks.
4. Disease Categories: Utilizing ICD-10 codes, this variable categorizes the types of diseases treated, allowing for a detailed analysis of the impact of specific conditions on drug costs.
5. Insurance Status: Differentiating between SFMA and CSHI coverage helps assess how insurance type influences medication access and overall drug expenditure.

We used the 95th percentile of the expenditure distribution as a threshold to define High-Cost prescription drug Users (HCUs). The outcomes compared in the study included the number of patients, average costs per patient, and total annual costs. Additionally, the top 10 most costly diagnoses within the HCUs group were analyzed across all age groups and specifically for children under 18 and adults, providing a comprehensive overview of drug utilization patterns in Kazakhstan.

Results

A total of 2.2 million patients received outpatient medicines, as outlined in Figure 1. This provision was distributed among different healthcare frameworks, with 1.1 million patients, accounting for 32%, receiving care within the SFMA. Additionally, the CSHI catered to 1.6 million patients, constituting 58% of the total prescription medicine recipients. Among these, 1.5 million were adults, comprising 70%, while 477 thousand were children, making up the remaining 30%.

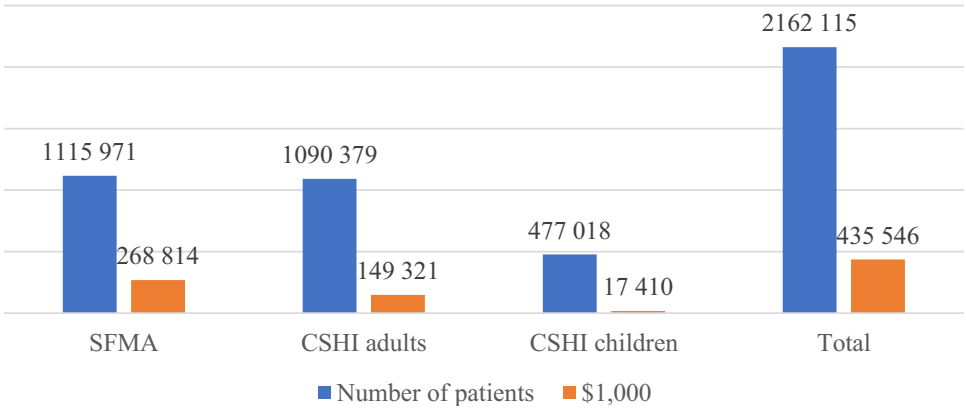

Figure 1 Pharmaceutical Costs Within the Framework of the Statutory Free Medical Assistance (SFMA) and the Compulsory Social Health Insurance (CSHI) in 2022.

It was computed that the annual medication supply costs exceeding the 95th percentile threshold for HCUs encompassed 108,122 individuals, resulting in total pharmaceutical spending of $320.4 million. Consequently, these HCUs, constituting only 5% of Kazakhstan's total population reliant on drug provision within the frameworks of SFMA and CSHI, played a substantial financial role, contributing to a noteworthy 74% of total prescription spending.

Demographic Characteristics

As depicted in Table 1 for 2022, there were no significant disparities in gender distribution between HCUs and non-HCUs. Women constituted 58.1% of the high-cost group and 60.4% of the non-high-cost group. While male HCUs experienced higher expenses than females, the converse was true in the non-HCU cohort. Except for children under 10 years old, where there was a notable difference (2.5% in HCUs and 18.8% in non-HCUs), no significant variations in age were observed between the groups. Roughly 30% of prescription drug users in both cohorts were aged over 65, with those aged 66 and above accounting for 7.1% in the high-cost group and 10.0% in the non-high-cost group among the elderly. There were more representatives of working age (21–60 years) in the HCU group than in the non-HCU group (46.6% vs 36.6%).

In the high-cost group, pediatric patients aged 0–5 exhibited the highest average costs per patient, while among low-cost drug users, costs increased with age until 90 years old, after which they declined. Within HCUs, 22.4% of costs were attributed to individuals under 20, 46.8% to those of working age (21–60), and 30.8% to users aged 61 and older. Conversely, in the non-HCU group, this distribution was 6.1%, 36.6%, and 57.4%, respectively. Notably, individuals between 61 and 65 years old incurred the highest total pharmaceutical costs in both groups.

Number of Medications

HCUs were significantly more likely to experience polypharmacy compared to non-high-cost users. The number of medications prescribed to HCUs showed considerable variation, as highlighted in Table 2. Over half of the individuals in the high-cost group were prescribed more than six different drugs per year. In contrast, the majority of patients in the non-high-cost group used five or fewer medications, with 84.5% of total drug expenses concentrated in this subgroup. An interesting observation in the high-cost user group is that the average cost for individuals taking five medications or fewer was at least 2.8 times higher than in subgroups prescribed more than five medications. In contrast, within the non-high-cost group, a clear correlation was evident between average cost and the quantity of medications consumed. Nevertheless, in both groups, approximately 90% of the total drug costs were linked to patients prescribed fewer than 10 drugs.

Morbidity

The analysis uncovered significant disparities in the top 10 most expensive diseases between the high-cost and non-high-cost groups, with commonalities including the presence of diabetes, rheumatoid arthritis, mental illness, and certain types

Table 1 Pharmaceutical Costs of High-Cost Users and Non- High-Cost Users by Age and Gender

Gender and Age	HCUs*				Non-HCUs			
	N	%	Average Cost Per Patient, $	Total costs, $1000	N	%	Average Cost Per Patient, $	Total Costs, $1000
Women	62,805	58.1	2,448.0	153,748.4	1,239,604	60.4	54.0	66,963.8
Men	45,317	41.9	3,751.5	170,008.5	814,405	39.6	55.0	44,825.1
0–5	646	0.6	16,025.1	10,352.2	275,984	13.4	5.6	1,550.3
6–10	2,078	1.9	11,338.3	23,560.9	109,840	5.3	17.2	1,894.3
11–15	3,245	3.0	6,666.8	21,633.8	60,590	2.9	30.6	1,854.1
16–20	3,062	2.8	5,569.8	17,054.7	33,277	1.6	44.0	1,465.3
21–25	2,105	2.0	5,385.9	11,337.3	19,744	1.0	58.2	1,149.4
26–30	2,750	2.5	3,488.9	9,594.3	26,826	1.3	57.6	1,544.6
31–35	4,317	4.0	4,119.3	17,783.2	39,283	1.9	60.5	2,376.1
36–40	5,494	5.1	3,264.5	17,934.9	51,066	2.5	62.8	3,208.1
41–45	6,163	5.7	3,211.4	19,791.6	67,570	3.3	62.1	4,196.7
46–50	7,660	7.1	2,744.0	21,019.2	99,111	4.8	62.1	6,157.7
51–55	9,524	8.8	2,567.6	24,453.5	144,316	7.0	62.6	9,040.9
56–60	12,373	11.4	2,394.7	29,629.5	201,623	9.8	65.6	13,230.6
61–65	16,231	15.0	2,134.1	34,637.9	270,135	13.2	67.9	18,333.3
66–70	13,827	12.8	2,062.6	28,519.2	248,289	12.1	69.7	17,305.7
71–75	10,962	10.1	2,047.5	22,444.8	201,025	9.8	73.0	14,684.0
76–80	4,441	4.1	1,850.0	8,215.8	90,604	4.4	72.7	6,583.1
81–85	2,411	2.2	1,769.5	4,266.2	76,795	3.7	64.8	4,975.8
86–90	736	0.7	1,967.7	1,448.2	30,158	1.5	61.0	1,839.4
91–95	88	0.1	826.0	72.7	6,510	0.3	53.4	347.6
96–100	8	0.0	803.0	6.4	1,165	0.1	41.6	48.5
100-	1	-	606.4	0.6	98	0.0	35.4	3.5

Abbreviation: HCUs*, High-cost users.

Table 2 Pharmaceutical Costs According to the Number of Drugs Used (Different ATC Classes)

Number of Drugs	High-Cost Users					Non-High-Cost Users				
	N	%	Average Cost Per Patient,$	Total Costs, $1000	%	N	%	Average Cost Per Patient, $	Total Costs, $1000	%
1–5	47,395	43.8	4,855	230,105	71.1	1,736,338	84.5	37	64,549	57.7
6–10	36,844	34.1	1,726	63,586	19.6	282,727	13.8	136	38,312	34.3
11–15	17,878	16.5	1,242	22,201	6.9	32,521	1.6	249	8,111	7.3
16–20	5,116	4.7	1,247	6,380	2.0	2,317	0.1	336	778	0.7
21-	889	0.8	1,671	1,485	0.5	103	0.0	373	38	0.0

of cancer on both lists. Notably, diabetes mellitus ranked among the top three for associated costs in both groups, securing second place in the high-cost group and claiming the top spot in the non-high-cost group. Cancer held the top position in terms of costs among HCUs and featured in the top ten among non-HCUs (Table 3). In the high-cost group, the highest expenses were linked to the treatment of cancer and malignant neoplasms, while patients with deficiencies of coagulation factors, mucopolysaccharidosis, and spinal muscular pathologies were also overrepresented (Table 4). In the non-high-cost group, about one-tenth of all costs were associated with respiratory diseases, such as chronic obstructive pulmonary disease (COPD) and bronchial asthma. The top ten also included epilepsy and arrhythmias.

Table 3 Pharmaceutical Costs According to morbidity (Ordered by the Combined Costs)

#	Disease, ICD-10 code	High-Cost drug users					Disease, ICD-10 Code	Low-Cost Drug Users				
		N	%	Average Cost Per Patient, USD	Total Costs, 1000 USD	%		N	%	Average Cost per Patient, USD	Total Costs, 1000 USD	%
1	Oncological diseases, C00-97, D00-48 (except D35.2)	12,557	5.4	4,644	58,319	18.0	Diabetes mellitus, E10-E11	323,146	10.5	114	36,744	32.9
2	Diabetes mellitus, E10-E11	57,549	24.8	815	46,929	14.5	Arterial hypertension, I10-I15	1,060,178	34.4	25	26,166	23.4
3	Malignant neoplasms, D45-47.9, C81–C96 D56, D57, D59.5, D61, D69.3, D76. 0.	2,724	1.2	15,753	42,911	13.3	Coronary heart disease (CHD), I20-I25	409,647	13.3	18	7,204	6.4
4	Hereditary deficiencies of blood coagulation factors, D66-D68	1,046	0.5	28,871	30,200	9.3	Chronic obstructive pulmonary disease, J44	56,167	1.8	108	6,055	5.4
5	Mucopolysaccharidosis, E76.0, E76.1, E76.2, E76.3, E76.8	79	0.0	252,877	19,977	6.2	Bronchial asthma, J45	76,919	2.5	76	5,852	5.2
6	Rheumatoid arthritis, M05-M06	8,154	3.5	1,725	14,069	4.3	Epilepsy, G40	58,407	1.9	83	4,842	4.3
7	Mental disorders, F00-F99	7,368	3.2	1,398	10,301	3.2	Rheumatoid arthritis, M05-M06	30,366	1.0	153	4,644	4.2
8	Multiple sclerosis, G35	1,551	0.7	6,642	10,301	3.2	Mental disorders, F00-F99	44,495	1.4	79	3,537	3.2
9	Spinal muscular atrophy, G12	41	0.0	248,473	10,187	3.1	Arrhythmias, I47-I48	33,010	1.1	102	3,356	3.0
10	Duchenne muscular dystrophy, G71.0	29	0.0	306,381	8,885	2.7	Cancer, C00-97, D00-48 (except D35.2)	22,231	0.7	135	3,000	2.7

Table 4 Pharmaceutical Costs According to morbidity Among Pediatric and Adult HCUs (Ordered by the Combined Costs)

#	Disease, ICD-10 Code	High-Cost Drug Users, Children					Disease, ICD-10 code	High-Cost Drug Users, Adults				
		N	%	Average Cost Per Patient, USD	Total Costs, 1000 USD	%		N	%	Average Cost Per Patient, USD	Total Costs, 1000 USD	%
1	Hereditary deficiencies of blood coagulation factors, D66-D68	510	4.8	28,495	14,533	21.9	Cancer, C00-97, D00-48 (except D35.2)	12,536	5.7	4,636	58,114	22.6
2	Mucopolysaccharidosis, E76.0, E76.1, E76.2, E76.3, E76.8	65	0.6	203,743	13,243	19.9	Diabetes mellitus E10-E11	54,187	24.5	774	41,923	16.3
3	Spinal muscular atrophy, G12	38	0.4	247,851	9,418	14.2	Malignant neoplasms, D45-47.9, C81–C96 D56, D57, D59.5, D61, D69.3, D76. 0.	2,394	1.1	16,415	39,298	15.3
4	Duchenne muscular dystrophy, G71.0	29	0.3	306,095	8,877	13.4	Hereditary deficiencies of blood coagulation factors, D66-D68	536	0.2	29,177	15,639	6.1
5	Diabetes mellitus, E10-E11	3,367	31.6	1,474	4,961	7.5	Rheumatoid arthritis, M05-M06	8,154	3.7	1,724	14,056	5.5
6	Malignant neoplasms, D45-47.9, C81–C96 D56, D57, D59.5, D61, D69.3, D76. 0.	330	3.1	10,826	3,573	5.4	Mental illnesses, F00-F99	7,301	3.3	1,405	10,258	4.0
7	Cystic fibrosis (Cystic fibrosis), E84	163	1.5	11,488	1,872	2.8	Multiple sclerosis, G35	1,538	0.7	6,656	10,238	4.0
8	Pituitary dwarfism, Shereshevsky-Turner syndrome, E23	827	7.8	2,091	1,729	2.6	Mucopolysaccharidosis, E76.0, E76.1, E76.2, E76.3, E76.8	14	0.0	479,668	6,715	2.6
9	Juvenile arthritis, M08	510	4.8	28,495	14,533	21.9	Condition after organ and tissue transplantation, Z94	1,966	0.9	3,395	6,675	2.6
10	Other sphingolipidoses, E75.2	65	0.6	203,743	13,243	19.9	Psoriasis, L40	1,009	0.5	6,255	6,311	2.5

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A substantial portion of costs, 77.9%, was attributed to 40% of HCUs. Similarly, in the non-HCU group, approximately 68.6% of patients accounted for 90.7% of all costs. In the high-cost group, the highest average costs per patient were linked to rare diseases, including mucopolysaccharidosis, spinal muscular atrophy (SMA), and Duchenne muscular dystrophy. In contrast, in the non-high-cost group, the primary contributors to average costs per patient were chronic conditions such as rheumatoid arthritis, diabetes, and COPD.

Regarding medication recipients, the top three diagnoses in both groups included diabetes mellitus, arterial hypertension, and coronary heart disease (CHD). In the high-cost group, 24.8% of medication recipients were diagnosed with diabetes mellitus, while 20.3% and 11.8% of the entire cohort had arterial hypertension and coronary artery disease, respectively. In the non-high-cost group, arterial hypertension claimed first position, affecting more than a third of users (34.4%), followed by CHD and diabetes at 13.3% and 10.5%, respectively.

The analysis of a subgroup of HCUs revealed that among children, the top 10 most costly diseases included deficiencies of blood coagulation factors, rare hereditary diseases such as mucopolysaccharidosis, SMA, Duchenne muscular dystrophy, cystic fibrosis, and pituitary dwarfism, along with diabetes mellitus, malignant neoplasms, and juvenile arthritis. For adults in this group, the highest costs were associated with cancer and malignancies, diabetes mellitus, clotting factor deficiencies, rheumatoid arthritis, mental disorders, multiple sclerosis, mucopolysaccharidosis, post-transplant states, and psoriasis.

Among children of HCUs, 92% of all costs were incurred by 5,908 individuals, constituting 55.5% of this cohort. In the group of adult HCUs, 81.4% of all costs were attributed to 89,635 individuals, accounting for 40.5% of the population. The highest average per capita spending among children in this group was for orphan drugs used to treat rare diseases, including Duchenne muscular dystrophy, SMA, and mucopolysaccharidosis. For adults, mucopolysaccharidosis led significantly in terms of average costs, with cancer and malignant neoplasms ranking second and third.

Regarding the number of patients among adult HCUs, the leading diagnoses included diabetes mellitus, arterial hypertension, coronary heart disease, cancer, and chronic heart failure. Among children, the top five diagnoses were diabetes mellitus, pituitary dwarfism, epilepsy, juvenile arthritis, and acute lower respiratory tract infections.

Discussion

Kazakhstan maintains a list of reimbursable medications, medical devices, and specialized products funded by both the state budget and the social health insurance system. This list is regularly updated by the Ministry of Health (MoH) to ensure relevance and effectiveness in meeting the needs of citizens with specific conditions.

In 2022, Kazakhstan made significant progress in expanding its outpatient drug provision, covering 178 diseases and spending approximately $435.5 million to provide medication to 2.2 million patients through 15.2 million prescriptions. This marked a notable increase compared to 2019, when spending reached only $215 million, with coverage limited to 50 diseases. Over the same period, the number of reimbursable drugs and medical devices increased by 1.3 times. However, despite this expansion, there remains a significant gap between state-supported initiatives and out-of-pocket expenses. National health data revealed that while the government reimbursed $435.5 million for outpatient drugs in 2022, citizens spent a total of $978.9 million on medications—almost three times more. This discrepancy highlights the limitations of Kazakhstan's current reimbursement system, especially when compared to countries like the UK and Germany, where more comprehensive coverage for chronic and rare diseases is provided under universal healthcare systems.[13]

A unique challenge for Kazakhstan lies in the high costs associated with rare diseases, such as Duchenne muscular dystrophy and mucopolysaccharidosis. As the study results demonstrated, in 2022, 22.4% of total drug expenditure among high-cost users (HCUs) was dedicated to treating rare diseases. This is a substantial proportion compared to countries like South Korea, where healthcare spending is more focused on chronic diseases rather than rare, high-cost conditions.[14] Although the Kazakh government has implemented price controls on medications, these policies have yet to significantly curb the escalating costs, particularly for orphan drugs.

On a global scale, it is well-established that a small percentage of the population—typically around 5%—accounts for a disproportionate share of healthcare costs, especially in terms of pharmaceuticals.[5,6] This trend holds true in Kazakhstan, as our study revealed that the top 5% of patients, classified as HCUs, are eligible for drug coverage under the SFMA and CSHI programs, yet contributed to 74% of total pharmaceutical spending. Similar patterns are

observed in countries like Finland, where HCUs also comprise 5% of the population but drive more than 50% of drug-related costs.[5] This concentration of spending underscores the need for targeted policies to manage costs effectively within this high-cost group.

The study also highlighted gender differences among HCUs in Kazakhstan, with women comprising approximately 58% of this group, a figure consistent with global trends.[15,16] However, the data indicated that higher costs were more frequently associated with male patients. Notably, only about one-third of HCUs were over 65 years old, and this age group contributed less than 10% of the total drug costs. The highest average costs per patient were observed in children under 5, largely due to coverage for expensive treatments for rare congenital conditions like SMA and Duchenne muscular dystrophy.[17,18] In contrast, among non-HCUs, average costs increased with age, primarily driven by chronic conditions such as cardiovascular, endocrine, and respiratory diseases.[15]

Additionally, our study confirmed the prevalence of polypharmacy among HCUs, with a significant proportion of individuals using more than six medications per year—three times higher than in non-HCUs. This aligns with findings from other countries, where polypharmacy, particularly among older adults, has been linked to irrational drug use and adverse health outcomes, including increased mortality.[19,20]

The findings from this study reveal significant patterns in drug utilization and expenditure among HCUs in Kazakhstan. The gender distribution analysis showed no substantial differences, although male HCUs tend to incur higher expenses. The high costs associated with younger patients, particularly children under 5, and the concentration of expenditures among a small percentage of users underscore the need for targeted interventions and policy reforms. Future research is warranted to explore the dynamics of drug utilization further and to assess the broader implications of these findings in similar healthcare contexts.

The analysis of gender distribution between HCUs and non-HCUs shows no substantial differences, although male HCUs tend to incur higher expenses than their female counterparts. Notably, almost half of HCUs fall within the working and fertile age range, with children under 5 years of age exhibiting the highest average costs per patient. In contrast to the non-high-cost group, where costs rise proportionally with patient age, in the high-cost group, higher costs are associated with younger patients. Both groups exhibit the highest costs in the 61–65 years age bracket.

By the number of users, there is little divergence in the list of the top ten diseases between HCUs and non-HCUs. Lifestyle diseases such as diabetes mellitus, arterial hypertension, and coronary artery disease consistently rank in the top three for both groups. However, when assessing costs within the high-cost user group, rare hereditary diseases and cancer emerge as prominent contributors to overall spending.

The results highlight a pronounced skewness in the consumption of reimbursed outpatient drugs within Kazakhstan's healthcare system. Our analysis indicates that only 5% of the total population relies on prescription drugs, yet this small subset accounts for 74% of total outpatient drug costs. Subgroup analyses further illustrate that a significant proportion of drug costs are concentrated among half or fewer drug users, with up to 92% of all costs attributed to this group. This underscores the need for targeted cost containment strategies, in addition to broader measures such as price regulation and adjustments to reimbursement lists impacting the general population.

Furthermore, over half of HCUs engage in polypharmacy, receiving six or more types of medications annually. This finding emphasizes the necessity of exploring avenues for improving patient-specific treatment methods, including the introduction of best practices for disease management and patient monitoring.

Study Limitations and Implications

While this study provides valuable insights into the utilization of outpatient drugs in Kazakhstan, it is important to acknowledge potential biases and limitations. One primary limitation is the exclusion of drugs sold without a prescription, medications acquired by patients at their own expense, and those provided for the treatment of infectious diseases. This limitation may lead to an underestimation of total pharmaceutical costs and drug utilization patterns, particularly among vulnerable populations. The reliance on ISLO data may also introduce biases related to completeness and accuracy. Future research should aim to include a broader range of data sources to provide a more comprehensive understanding of drug utilization and costs.

Additionally, it is important to note that no statistical analysis was performed in this study. While statistical analysis is not strictly necessary, especially when dealing with non-normal populations where no normality tests have been conducted for expenditures, incorporating such analysis could enhance the coherence and reliability of the results. Future research should aim to include a broader range of data sources and apply statistical methodologies to provide a more comprehensive understanding of drug utilization and costs.

Conclusion

In conclusion, the findings from this study reveal significant patterns in drug utilization and expenditure among HCUs in Kazakhstan. The gender distribution analysis showed no substantial differences, although male HCUs tend to incur higher expenses. The high costs associated with younger patients, particularly children under 5, and the concentration of expenditures among a small percentage of users underscore the need for targeted interventions and policy reforms. Future research is warranted to explore the dynamics of drug utilization further and to assess the broader implications of these findings in similar healthcare contexts.

Data Sharing Statement

Materials and these articles are with the authors.

Ethical Approval

The study was approved by the Local Ethics Committee of the Kazakh National Medical university (№18, February 6, 2023), Almaty, Kazakhstan.

Consent for Publication

All authors consent for publication.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation; took part in drafting, revising, critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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