



Characteristics of consumers of hypoglycemic drugs within the framework of preferential drug provision, using the example of the Stavropol Territory

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The aim. To study the main characteristics of consumers of hypoglycemic drugs (HGD) within the framework of preferential drug provision (PDP) in the Stavropol Territory (ST).

Materials and methods. The study was based on depersonalized information about patients with diabetes mellitus (DM) from the database of clinical and epidemiological monitoring of DM and data from the Regional Endocrinological Dispensary. Methods of comparative, retrospective, graphical analyses, grouping, and determination of average values were used.

Results. Among the beneficiaries with DM in the ST, individuals with type II DM prevail. In the type I DM group, men predominate (over 55.0%), while among patients with type II DM, women predominate (65.0%). The largest proportion among beneficiaries with type I DM is occupied by individuals from 30 to 60 years old, with type II DM, individuals aged 60 to 80 years predominate (70.44% — 2025). The increase in the number of beneficiaries with a disease duration of up to 5 years and over 10 years was noted. The life expectancy of beneficiaries with type I DM tends to increase slightly but steadily, while for patients with type II DM, it remains practically unchanged. A positive trend was noted in achieving the norm of glycated hemoglobin (HbA_{1c}) in beneficiaries with type I DM, and for every third patient with type II DM. For every third beneficiary with type I DM and for 70.0% with type II DM, body mass index (BMI) values are above normal. The structure of HGD consumption was determined, and changes in the ratio of the use of groups of oral HGD and individual trade names of drugs were revealed.

Conclusion. The general characteristics of beneficiaries with DM were identified, depending on its type, age and sex composition, duration of the disease, life expectancy, achievement of glycated hemoglobin levels, BMI, and the use of drugs in therapy.

Keywords: diabetes mellitus; beneficiaries; hypoglycemic agents; consumer portrait; Stavropol Territory

Abbreviations: HGD — hypoglycemic drugs; IDF — International Diabetes Federation; DM — diabetes mellitus; SSD — socially significant diseases; PDP — preferential drug provision; DP — drugs; HbA_{1c} — glycated hemoglobin; BMI — body mass index; TN — trade name.

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Характеристика потребителей сахароснижающих препаратов в рамках льготного лекарственного обеспечения на примере Ставропольского края

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Цель. Изучить основные характеристики потребителей сахароснижающих препаратов (ССП) в рамках льготного лекарственного обеспечения (ЛЛО) в Ставропольском крае (СК).

Материалы и методы. Основу исследования составила деперсонифицированная информация о пациентах с сахарным диабетом (СД) базы данных клинико-эпидемиологического мониторинга СД и данных ГБУЗ СК «Краевой эндокринологический диспансер». Использованы методы сравнительного, ретроспективного, графического анализов, группировки, определения средних величин.

Результаты. Среди льготополучателей с СД в СК преобладают лица с СД II типа. В группе СД I типа преобладают мужчины (свыше 55,0%), среди пациентов с СД II типа — женщины (65,0%). Наибольший удельный вес среди льготополучателей с СД I типа занимают лица от 30 до 60 лет, с СД II типа преобладают лица в возрасте от 60 до 80 лет, (70,44% — 2025 г.). Отмечено увеличение численности льготополучателей с длительностью течения заболевания до 5 лет и свыше 10 лет. Продолжительность жизни льготополучателей с СД I типа имеет тенденцию незначительного, но стабильного повышения, для пациентов с СД II типа — остается практически неизменной. Отмечена положительная тенденция в достижении нормы гликированного гемоглобина (HbA_{1c}) у льготополучателей с СД I типа, и для каждого третьего пациента с СД II типа. Для каждого третьего льготополучателя с СД I типа и для 70,0% с СД II типа значения индекса массы тела (ИМТ) выше нормы. Определена структура потребления ССП и выявлены изменения в соотношении использования групп пероральных ССП и отдельных торговых наименований лекарственных препаратов.

Заключение. Выделены общие характеристики льготополучателей с СД в зависимости от его типа, половозрастного состава, длительности заболевания, продолжительности жизни, достижению уровня гликированного гемоглобина, ИМТ, использованию ЛП в терапии.

Ключевые слова: сахарный диабет; льготополучатели; сахароснижающие средства; портрет потребителя; Ставропольский край

Список сокращений: ССП — сахароснижающие препараты; IDF — Международной федерации диабета; СД — сахарный диабет; СЗЗ — социально значимые заболевания; ЛЛО — льготное лекарственное обеспечение; ЛП — лекарственные препараты; HbA_{1c} — гликированный гемоглобин; ИМТ — индекс массы тела; ТН — торговое наименование.

INTRODUCTION

The characteristics of groups of beneficiaries with various forms of diseases can be considered as a complex of common and stable features, demographic and social indicators, gender differences, allowing to analyze the state of health, identify problematic issues in the organization of medical care and drug provision, develop a generalized approach to the needs of the patient, determine the level of his satisfaction and form target groups for a qualitative assessment of morbidity

and the effectiveness of measures to improve medical care and drug provision [1–3].

The study of the medical and social status of patients is of interest to many researchers and is carried out at various stages of medical care: at the inpatient stage, the contingent of patients by the underlying disease and the presence of concomitant diseases, taking into account the results of treatment and the costs of the health care system [4, 5]; at the outpatient stage — combining the obtained results of

the patient's social portrait, the realization of his needs, the degree of satisfaction with adherence to treatment, assessments of medical care and provision of drugs [6, 7]. The results of the formation of a clinical and social portrait of patients with various diseases, carried out at different times and in various subjects of the Russian Federation [8–10]. The results allow us to obtain not only the general idea of the structure of diseases in this territory, to study the prevalence of individual diseases, to establish the variability of indicators and to obtain characteristics of patients that can be used in the formation of groups for clinical trials [11], in the development and implementation of regionally adapted programs of medical care, prevention and rehabilitation of patients, but also to assess the level of organization of drug supply [12].

The high prevalence of diabetes mellitus (DM), the high risk of disability of the working-age population [13–15], the provision of these patients with medicines at the expense of budgets of all levels, contributes to the expansion of the direction of scientific research related to the prevalence of diseases based on statistical data [16], the formation of a social portrait of the main contingent of patients with DM in the Russian Federation [17], the study of social characteristics of patients with DM, taking into account the complications of the course of the disease [19–21]. All of the above contributes to the study and forecasting of the hypoglycemic drugs (HGDs) market, the adoption of informed management decisions on planning the volume and use of health care resources, as well as the identification of variability in the subjects of the Russian Federation when using drugs in the treatment of patients with DM who are entitled to preferential drug provision (PDP), contributes to the assessment of hypoglycemic therapy and changes in the tactics of using drugs.

The database of clinical and epidemiological monitoring of DM in the Russian Federation (<https://diaregistry.ru/>) serves as a source of the number of patients with DM. According to the data as of July 01, 2025, the number of patients with type I DM was 304,587 people, type II DM — 5,227,108 people. In accordance with the ranking of regions published on this website, the Stavropol Territory as of 01.07.2025 ranked 44th in the ranking, in 2024 — 36th place, which indicates the increase in the incidence¹, in addition, it is important to note that DM is classified as a socially significant disease².

¹ SD monitoring. Database of clinical and epidemiological monitoring of diabetes mellitus in the Russian Federation. Available from: <https://sd.diaregistry.ru/content/o-proekte.html#content>

² Decree of the Government of the Russian Federation No. 715 dated Dec 01, 2004 "On Approval of the List of socially significant diseases and the list of diseases that pose a danger to others" (revision dated Jan 31, 2020; effective from Feb 11, 2020). Available from: <https://normativ.kontur.ru/document?moduleId=1&documentId=356130>. Russian

THE AIM. To study the main characteristics of consumers of hypoglycemic drugs within the framework of preferential drug provision in the Stavropol Territory.

The following tasks were solved:

- the gender and age characteristics of beneficiaries with type I and II DM were studied;
- the distribution and structuring of beneficiaries with DM depending on the duration of the disease was carried out;
- the average life expectancy of beneficiaries with DM was determined;
- the dynamics of changes in the indicator of glycated hemoglobin (HbA_{1c}) and body mass index (BMI) of HGD consumers were studied;
- groups of HGD used in the treatment of DM were identified.

MATERIALS AND METHODS

Methodology

Using the database of clinical and epidemiological monitoring of the number of patients with DM in the Stavropol Territory³ in the period from 2020 to 2025 as of July 01, 2025 and data from the Regional Endocrinological Dispensary, a copy of depersonalized information about patients with type I and II DM was made. The selected information was systematized depending on the type of DM, gender, age, duration of the disease, anthropometric characteristics (height, weight of the patient), the value of the results of laboratory studies of glycated hemoglobin (HbA_{1c}), the therapy, which allowed to obtain the gender and age characteristics of beneficiaries, to conduct an analysis of the duration of the disease, the value of the body mass index (BMI), the achievement of target indicators for life expectancy and glycated hemoglobin. Grouping of beneficiaries by the use of insulin therapy and oral HGD allowed to determine the proportion of drugs used in the treatment of DM.

The methods of comparative, retrospective analysis, grouping of indicators were used. To work with digital data, MS Excel 2021 spreadsheets (Microsoft Corp., USA) were used, containing a set of standard formulas and functions for performing mathematical operations. The specific weight of each group of patients by age, duration of the disease, BMI values, the use of PSP was determined as the ratio of the grouped number of patients to the total number of patients, the result was expressed as a percentage.

³ DM monitoring. Database of clinical and epidemiological monitoring of diabetes mellitus in the Russian Federation

The average life expectancy with DM [22, 23] was calculated as the ratio of the total number of years lived by all patients with DM to the total number of patients with DM in the analyzed period (year):

$$ALE = \frac{\sum_{i=0}^n YL}{N - n},$$

where ALE — average life expectancy, n years; YL — total number of years lived, person/years (defined as the total sum of years lived by all patients with DM); N — total number of patients with DM, n — the number of patients who died in the analyzed period, year.

To determine the proportion of patients by the level of the laboratory indicator of HbA_{1c}, the approved boundaries of the indicator were used — less than 7%, from 7.0 to 7.9%, from 8.0 to 8.9%, — indicated in the approved recommendations “Algorithms of specialized medical care for patients with diabetes mellitus”⁴ [24] and clinical guidelines^{5, 6}. The proportion of patients with the achieved level of the indicator was calculated using the formula:

$$D = \frac{n \times 100\%}{N},$$

where D — proportion of patients with the achieved level of HbA_{1c} %; n — number of patients with the selected level of HbA_{1c}, number of people; N — total number of patients with the specified level of HbA_{1c}, number of people.

To determine the BMI, the Quetelet method was used, as the ratio of body weight in kilograms and the patient’s height value, expressed in meters, squared [25]:

$$BMI = \frac{\text{body weight, kg}}{\text{height, m}^2},$$

To interpret the obtained results of the BMI data, the WHO recommendations were used [26]: BMI values up to 18.49 — underweight; from 18.5 to 24.99 — normal body weight; from 25.0 to 29.99 — overweight (pre-obesity); and over 30.0 — obesity.

Ethics approval

The authors did not obtain approval from any Ethics Committee for this study. The study was

⁴ Algorithms of specialized medical care for patients with diabetes mellitus; Dedov II, Shestakova MV, Sukhareva OYu, editors; 12th issue. Moscow; 2025. Available from: https://www.rosinsulin.ru/wp-content/uploads/2025/06/2025_algorithmy_12.pdf. Russian

⁵ Clinical Guidelines. Type 2 diabetes mellitus in adults. Available from: https://cr.minzdrav.gov.ru/preview-cr/290_2. Russian

⁶ Clinical Guidelines. Type 1 diabetes mellitus in adults. Available from: https://cr.minzdrav.gov.ru/preview-cr/286_2. Russian

conducted without the involvement of patients as study participants or as objects of study; does not contain information about treatment protocols; clinical testing of treatment methods and the results of the use of drugs; is not associated with a potential risk for patients, since the study did not resort to any type of medical intervention that would require written consent of the patient and approval of any Ethics Committee.

The information was obtained by extracting information from the database of clinical and epidemiological monitoring of the number of patients with DM in the Stavropol Territory and data from the Regional Endocrinological Dispensary, which did not contain personalized information about specific patients.

Statistical analysis

To work with digital data, MS Excel 2021 spreadsheets (Microsoft Corp., USA) were used, containing a set of standard formulas and functions for performing mathematical operations. The above describes the methods used for calculating indicators with an indication of formulas, as well as the boundaries of indicator values used for interpreting the results with reference to literature sources.

RESULTS

De-identified information on beneficiaries with DM in the Stavropol Territory, grouped by year, depending on gender and type of DM, is presented in Table 1.

In the general population of beneficiaries with DM in the Stavropol Territory, patients with type 2 DM predominate, accounting for up to 95.0% (73,577 beneficiaries in 2025). The results obtained are consistent with data on the prevalence of DM in other regions of the Russian Federation [27]. It is important to note an increase in the proportion of patients with type 2 DM from 94.70% (68,965 patients) in 2020 to 95.44% (73,577 patients) in 2025 in the total patient population. Among patients with type 1 DM, men predominate, their proportion being slightly more than 55.0% (1940 patients in 2025). At the same time, women prevail among patients with type 2 DM, their proportion being over 65.0% (48,492 patients in 2025).

The characteristics of the age structure of beneficiaries with type 1 DM are presented in Figure 1.

The data on the age structure of patients with type 1 DM indicate a predominance of individuals aged

30 to 60 years. The proportion of patients in this age group tends to increase from 57.55 to 64.58%, with an average value of 55.61%, i.e., practically every second beneficiary is in this age category. The proportion of beneficiaries with type 1 DM under the age of 30 tends to decrease from 30.26% in 2020 (1169 people) to 25.86% in 2025 (909 people), the average proportion of this group is 34.74%. Thus, every third patient is under 30 years of age. Beneficiaries aged 60 to 80 years account for slightly more than 9.0%, the average value of the proportion of this group is 9.38%; the proportion of patients over 80 years is insignificant — up to 1.0%.

The results of studying the age structure of beneficiaries with type 2 DM are presented in Figure 2.

Among patients with type 2 DM, individuals aged 60 to 80 years predominate: the proportion of this group tends to increase from 66.78% in 2020 (46,055 people) to 70.44% in 2025 (51,824 people), with an average proportion of this group of 69.0%. In the analyzed period, the proportion of beneficiaries aged 30 to 60 years increased from 13.15% (9072 people) in 2020 to 21.85% (16,079 people) in 2025, with an average value of 17.98%, patients over 80 years of age account for an average of 12.93%.

Based on the fact that DM is a chronic disease, we grouped the number of beneficiaries depending on the duration of the disease. For the analysis, the following duration boundaries were identified: up to 5 years, from 5 to 10 years, and over 10 years. The results of the analysis are presented in Figure 3.

The data presented indicate an increase in the proportion of beneficiaries with type 1 DM with a disease duration of up to 5 years, the proportion of such patients increased from 4.22% (163 people) in 2020 to 23.94% (1067 people) in 2024, and, although in 2025 there is a decrease in the proportion to 15.11% (531 people), the average value of 14.70% still exceeds the value of 2020. The increase in the number of people with a short duration of the disease indicates the well-coordinated work of the diagnostic service of the region in identifying forms of DM in patients. The duration of the disease of every fifth patient is from 5 to 10 years (the average proportion of this group is 22.92%). The largest proportion is occupied by the group of patients with a disease duration of more than 10 years, while in the analyzed period there is some reduction in the proportion of this category of patients from 70.52% (2724 people) to 66.6% (2341 people), with an average value of 62.39%, which is a positive factor and indicates a positive organization of

both medical care and drug provision for patients with type 1 DM.

Figure 4 shows the structure of beneficiaries with type 2 DM by duration of the disease.

The data demonstrates a tendency to increase the proportion of beneficiaries with a disease duration of up to 5 years, in the analyzed period their share increased sevenfold, from 5.78% (3988 people) in 2020 to 38.39% (28,247 people) in 2025, with an average value of 23.13%. In our opinion, the increase in the proportion of beneficiaries in this age group is associated with the skillful organization of DM diagnosis. The proportion of beneficiaries with a disease duration of 5 to 10 years (average value 29.94%) tends to decrease, the dynamics of change from 33.31% (22,969 people) in 2020 to 26.05% (19,167 people) in 2025, which is a negative point and indicates the need for a more detailed study of the reasons for the decrease in the number of patients in this age category. A positive fact is the predominance in the analyzed group of people with disease duration of more than 10 years, practically every third (average value 46.94%) beneficiary with disease duration of more than 10 years. The tendency to decrease in the analyzed period the proportion of this group from 60.91% (42,008 people) in 2020 to 35.56% (26,163 people) in 2025 may be an independent area of scientific research to study the reasons for the reduction in the number of patients.

The study of the structure of the duration of the disease of beneficiaries with DM, both type I and type II, showed a tendency to the predominance of people with a disease duration of more than 10 years, which indicates the availability of medical care and drug provision for patients with DM, allowing to increase their life expectancy.

The results of a comparative analysis of the average life expectancy of beneficiaries with DM are presented in Figure 5.

The results of the study indicate a slight but steady increase in life expectancy in beneficiaries with type 1 DM, which in the analyzed period increased from 49.79 years in 2020 to 57.36 years in 2025. The life expectancy of beneficiaries with type 2 DM remains practically stable — about 73 years. It is necessary to indicate the predominance of the life expectancy indicator of beneficiaries with type 2 DM, which in 2025 was 72.38 years, over that of beneficiaries with type 1 DM — 57.36 years (2025), which is a significant achievement of the organization of medical care and drug provision for patients in the Stavropol Territory.

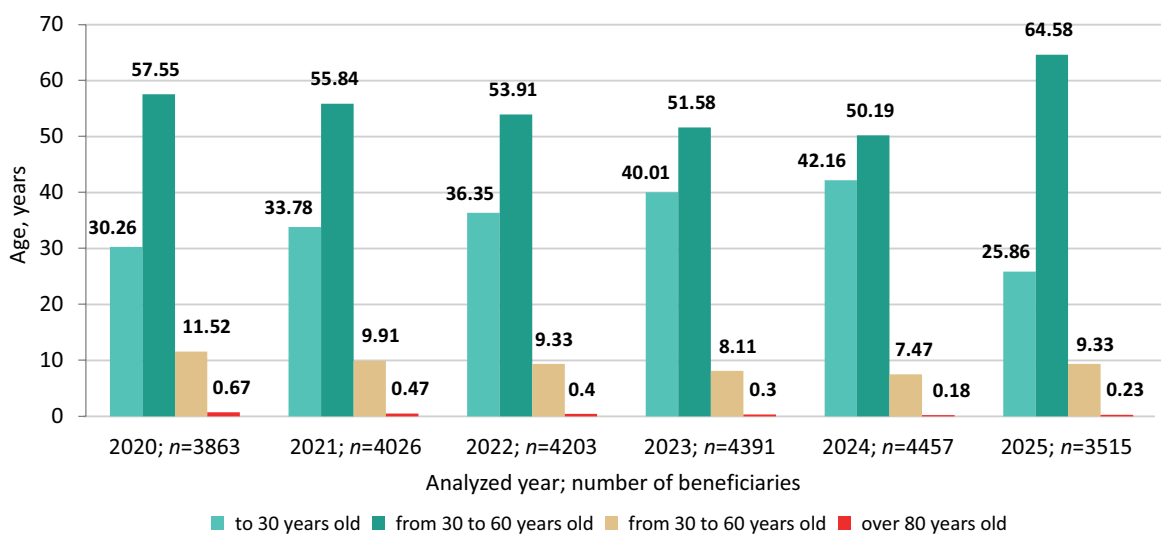


Figure 1 – Age composition of beneficiaries with type 1 diabetes mellitus in the Stavropol Territory, %

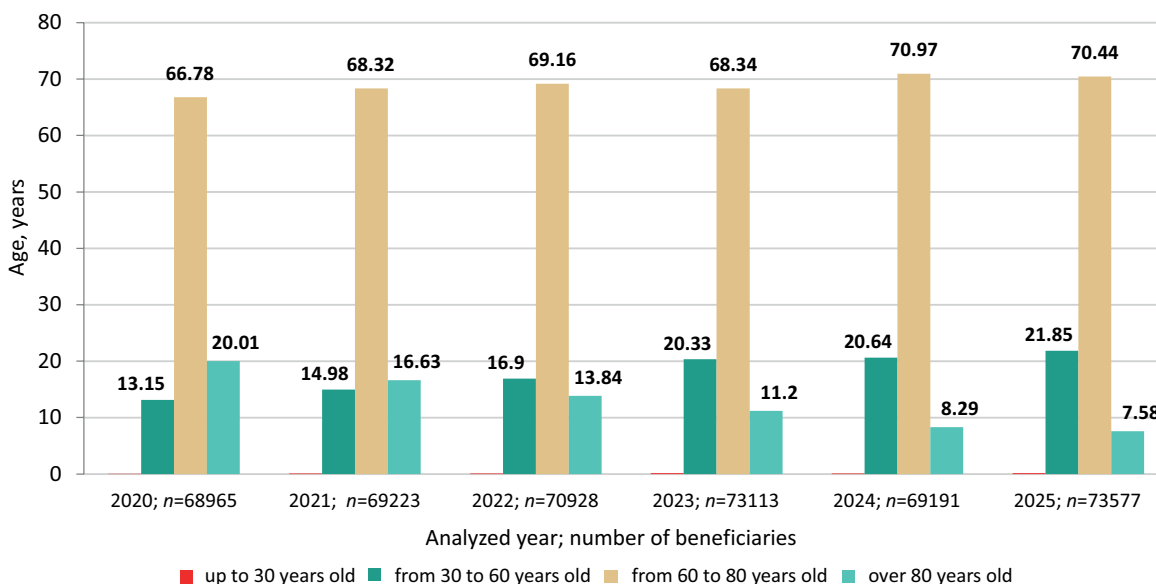


Figure 2 — Age composition of beneficiaries with type 2 diabetes mellitus in the Stavropol Territory, %

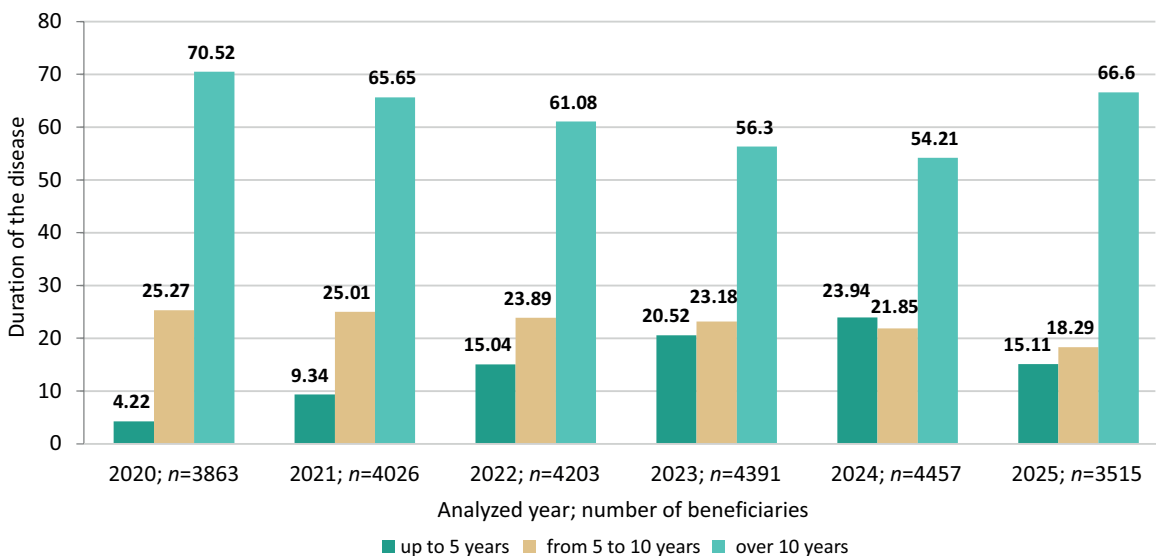


Figure 3 — Structure of beneficiaries with type 1 diabetes mellitus by duration of the disease, %

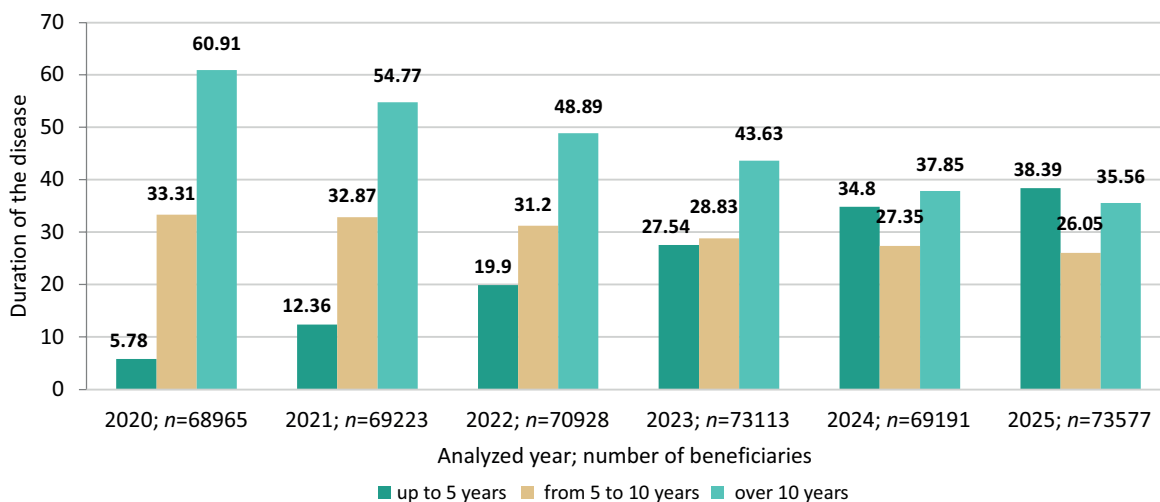


Figure 4 – Structure of beneficiaries with type 2 diabetes mellitus by duration of the disease, %

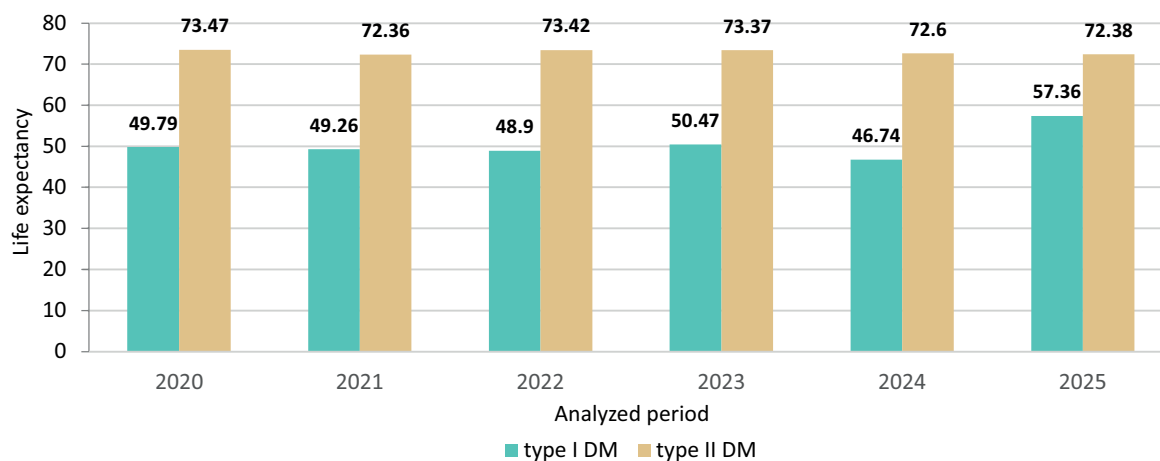


Figure 5 – Life expectancy of patients with diabetes mellitus, number of years

Table 1 – Depersonalized characteristics of the beneficiary population with diabetes mellitus in the Stavropol Territory

Indicator	Years					
	2020	2021	2022	2023	2024	2025
Total number of people, including	72828	73249	75131	77504	73648	77092
Diabetes mellitus type I						
Total number, people	3863	4026	4203	4391	4457	3515
Weight, %	5.30	5.50	5.59	5.67	6.05	4.56
men, %	2144 (55.50)	2230 (55.39)	2312 (55.01)	2390 (54.43)	2408 (54.03)	1940 (55.19)
women, %	1719 (44.50)	1796 (44.61)	1891 (44.99)	2001 (45.57)	2049 (45.97)	1575 (44.81)
Diabetes mellitus type II						
Total number, people	68965	69223	70928	73113	69191	73577
Weight, %	94.70	94.50	94.41	94.33	93.95	95.44
men, %	22379 (32.45)	22724 (32.83)	23577 (33.24)	24665 (33.74)	23331 (33.72)	25085 (34.09)
women, %	46586 (67.55)	46499 (67.17)	47351 (66.76)	48448 (66.26)	45860 (66.28)	48492 (65.91)

Table 2 — Monitoring the distribution of beneficiaries with diabetes mellitus by glycated hemoglobin (HbA_{1c})

Year	Total number of people	Laboratory data HbA _{1c} , %							
		<7,0		from 7.0 to 7.9		from 8.0 to 8.9		≥9,0	
		people	%	people	%	people	%	people	%
Type I DM									
2020	1937	409	21.12	660	34.07	411	21.22	457	23.59
2021	2031	530	26.10	643	31.66	407	20.04	451	22.21
2022	2175	575	26.44	726	33.38	446	20.51	428	19.68
2023	2857	798	27.93	1246	43.61	415	14.53	398	13.93
2024	3958	1040	26.28	1402	35.42	665	16.80	851	21.50
2025	1986	475	23.92	716	36.05	340	17.12	455	22.91
Type II DM									
2020	24794	7914	31.92	9529	38.43	4490	18.11	2861	11.54
2021	28388	9742	34.32	10575	37.25	5235	18.44	2836	9.99
2022	27446	11248	40.98	9898	36.06	3820	13.92	2480	9.04
2023	43038	17096	39.72	18037	41.91	4540	10.55	3365	7.82
2024	59707	21933	36.73	24625	41.24	6996	11.72	6153	10.31
2025	33445	12013	35.92	13531	40.46	3849	11.51	4052	12.12

Note: DM — diabetes mellitus.

Table 3 — Monitoring the distribution of patients with diabetes mellitus by body mass index, %

Year	Total number of people	Level of patients (%) with BMI value							
		<18,49		from 18.50 to 24.99		from 25.0 to 29.99		≥30,0	
		people	%	people	%	people	%	people	%
Type I DM									
2020	3031	293	9.67	1825	60.21	662	21.84	251	8.28
2021	3157	290	9.19	1892	59.93	697	22.08	278	8.80
2022	3475	443	12.75	2027	58.33	731	21.04	274	7.88
2023	3712	471	12.69	2136	57.54	795	21.42	310	8.35
2024	5088	585	11.50	3024	59.43	1112	21.86	367	7.21
2025	2821	85	3.01	1802	63.88	686	24.32	248	7.79
Average BMI values, %	—	—	9.80	—	59.89	—	22.09	—	8.22
Type II DM									
2020	46703	36	0.07	14638	31.34	11827	25.33	20202	43.26
2021	52868	46	0.09	16812	31.80	13695	25.90	22315	42.21
2022	54203	46	0.08	16518	30.47	13481	24.88	24158	44.57
2023	59559	59	0.09	18121	30.43	14747	24.76	26632	44.72
2024	80449	83	0.10	25117	31.23	20501	25.48	34748	43.19
2025	47574	59	0.12	14597	30.68	11763	24.73	21155	44.47
Average BMI values, %	—	—	0.09	—	30.99	—	25.18	—	43.74

Note: DM — diabetes mellitus; BMI — body mass index.

Table 4 — Groups of drugs used in the therapy of beneficiaries with type 2 diabetes mellitus, %

Years	Sulfonylurea derivatives, A10BB	Insulins, A10AB, A10AC, A10AD, A10AE	DPP-4 inhibitors, A10BH	SGLT2 inhibitors, A10BK	GLP-1 RA, A10BJ
2021	54.0	20.4	3.9	2.3	0.7
2022	53.3	20.4	5.6	4.2	0.8
2023	52.0	19.9	8.4	7.3	0.8
2024	51.6	20.4	13.2	12.6	1.3
2025	50.4	20.2	17.1	17.3	1.9

Note: DPP-4 — dipeptidyl peptidase-4; SGLT-2 — sodium-glucose cotransporter-2 inhibitors; GLP-1 RA — glucagon-like peptide-1 receptor agonists.

At the same time, the calculated life expectancy indicators of patients with DM are lower than the established target values specified in the regional program “Combating DM in the Stavropol Territory”⁷ (74.86 years) and Decree of the President of the Russian Federation No. 309 of May 7, 2024 (78 years)⁸.

The criterion for a retrospective assessment of the effectiveness of the use of hypoglycemic drugs or timely changes in therapy for beneficiaries with DM is the glycated hemoglobin indicator, which within the framework of the Federal Project “Combating DM” since 2023 has been a target indicator of the program⁹. The regional program “Combating DM in the Stavropol Territory”¹⁰ plans to increase the proportion of patients with DM who have reached a glycated hemoglobin level less than or equal to 7.0 by the end of 2022 to 40.70%.

Table 2 presents the results of retrospective monitoring of the distribution of beneficiaries by HbA_{1c} level for the period from 2020 to 2025.

The data presented clearly demonstrate an increase in the proportion of beneficiaries with type 1 DM with an HbA_{1c} level of up to 7.0% (normal according to clinical guidelines $\leq 7.0\%$ or less than 42 mmol/mol)^{11,12}. The proportion of beneficiaries with the achievement of the target HbA_{1c} level up to 7.0% in the analyzed period increased from 21.12% (409 people) in 2020 to 26.28% (3958 people) in 2024. Despite the fact that there was a slight decrease in the proportion in 2025 (23.92%, 475 people), this indicator exceeded the data for 2020. A positive fact is the decrease in the proportion of beneficiaries with a high HbA_{1c} level — from 8.0 to 8.9% — the proportion of such patients was 21.22% (411 people) in 2020, and in 2025 decreased to 17.12% (340 people), as well as a decrease in the proportion of beneficiaries with an HbA_{1c} value of more than 9.0% — from 23.59% (457 people) to 22.91% (455 people). The results of reducing the proportion

of patients with a high HbA_{1c} indicator indicate positive results in the organization of PDP for patients and correct hypoglycemic therapy.

At the same time, the use of hypoglycemic drugs provides a positive trend in achieving the norm of HbA_{1c} up to 7.0% for every third beneficiary with type 2 DM, the proportion of which increased from 31.92% (7914 people) in 2020 to 35.92% (12,013 people) in 2025. A significant achievement is the tendency to reduce the proportion of beneficiaries with higher HbA_{1c} values from 8.0 to 8.9, the proportion of such patients decreased from 18.11% (4490 people) in 2020 to 11.51% (3849 people) in 2025, but at the same time the proportion of patients with HbA_{1c} values from 7.0 to 7.9% and an indicator of more than 9.0% increases.

However, the proportion of beneficiaries with the achievement of the HbA_{1c} level up to 7.0% depends on the type of DM. Thus, the proportion of patients with type 2 DM (35.92% in 2025) exceeds the proportion of patients with type 1 DM (23.92% in 2025), but these results are still lower than the target indicators of the Federal Project “Combating DM” in which it is indicated that the proportion of patients in whom the glycated hemoglobin level will be less than or equal to 7.0% in 2025 should be more than 42% of the number of patients¹³. The results obtained indicate an autonomous scientific study of the use of hypoglycemic drugs.

The results of the distribution of beneficiaries by BMI are presented in Table 3.

BMI allows determining the proportion of patients with excess or insufficient weight, which can be used as a basis for adjusting hypoglycemic therapy for beneficiaries. The presented results indicate that the level of underweight is characteristic of 9.80% of patients with type 1 DM and is practically absent for beneficiaries with type 2 DM. The BMI for more than half of the beneficiaries (59.89%) with type 1 DM corresponds to the norm, and every third patient is obese. At the same time, only every third (30.99%) beneficiary with type 2 DM has a normal BMI value, and about 70.0% of beneficiaries are overweight.

Published results of studies [28, 29] indicate a relationship between increased BMI and obesity with negative consequences for organs and systems of the body and complications in DM.

Also, as a result of a previous study [30], the structure of consumption of hypoglycemic drugs

⁷ Resolution of the Government of the Stavropol Territory dated Apr 26, 2024 No. 230-p “On approval of the regional program “Combating diabetes in the Stavropol Territory”. Available from: <http://publication.pravo.gov.ru/document/2600202404270002?index=76>. Russian

⁸ Decree of the President of the Russian Federation dated May 07/2024 No. 309 “On the National Development Goals of the Russian Federation for the period up to 2030 and for the future up to 2036”. Available from: <https://normativ.kontur.ru/document?moduleId=1&documentId=470566>. Russian

⁹ Passport of the Federal Project “Fighting diabetes mellitus”. Available from: <https://diabetrda.ru/документы/борба-s-saharnym-diabetom/>. Russian

¹⁰ Resolution of the Government of the Stavropol Territory dated Apr 26, 2024 No. 230-p “On approval of the regional program “Combating diabetes in the Stavropol Territory”.

¹¹ Clinical Guidelines. Type 1 diabetes mellitus in adults.

¹² Clinical Guidelines. Type 2 diabetes mellitus in adults.

¹³ Passport of the Federal Project “Fighting diabetes mellitus”. Available from: <https://diabetrda.ru/документы/борба-s-saharnym-diabetom/>. Russian

depending on the type of DM was established: therapy for beneficiaries with type 1 DM is based only on insulin therapy, therapy for patients with type 2 DM includes the use of insulins and oral hypoglycemic agents. Further study of these drug prescriptions for beneficiaries allowed us to identify groups of drugs by ATC used for PDP for people with type 2 DM; data on the number of drugs for 9 months of each year were used for comparative analysis, table 4.

The presented data indicate changes in the ratio of oral hypoglycemic agents in the structure of diabetes therapy and an increase in the use of dipeptidyl peptidase-4 (DPP-4) inhibitors and sodium-glucose cotransporter type 2 (SGLT-2) inhibitors. At the same time, the ratio of the level of prescriptions of oral hypoglycemic agents from the iDPP-4 group increased from 3.9% in 2021 to 17.1% in 2025, including 29.5% in the last year. At the same time, the growth rate of prescribed drugs of the iSGLT-2 group increased - from 2.3% in 2020 to 17.3% in 2025, by 652.1% and by 37.3% for 2025. The increase in the proportion of these drug groups indicates the effectiveness and safety of drugs both in monotherapy and in combination therapy for DM [31, 32].

It should be noted that in the analyzed period there is a slight decrease in the prescription of sulfonylurea drugs — by 6.6%, the level of insulin therapy prescription remained practically unchanged. The group of glucagon-like peptide receptor agonists (GLP-1 RA) in the prescription structure also increased by 171% over the past 5 years — from 0.7% in 2020 to 1.9% in 2025, of which the growth for the period 2024–2025 amounted to 46.1%.

Thus, the retrospective comparative analysis allowed us to obtain the main characteristics of beneficiaries with DM in the Stavropol Territory, the ratio of changes in the structure of drug use, which should be combined with regional characteristics when organizing drug provision for patients in this group.

DISCUSSION

The high prevalence of severe non-communicable diseases is one of the main health problems in the modern world. One of these diseases is DM (DM). At the congress of the American Diabetes Association (ADA), which traditionally presents the latest advances in the diagnosis and treatment of DM in the world, new results on the prevalence of this disease were announced. According to the data of the International Diabetes Federation (IDF, International Diabetes

Federation) Atlas, in 2021 there were 237 million people with DM. Currently, the number of such patients has increased 2.5 times and reached 588 million people aged 20 to 79 years — this is almost every tenth inhabitant of the planet. According to IDF forecasts, by 2050 the number of patients is expected to increase to 853.0 million — every 8th inhabitant. According to other forecasts, the number will reach 1.3 billion; many researchers associate such results with the consequences of urbanization, increased life expectancy, and global aging of the population^{14,15,16}.

Among the patients with DM in the Stavropol Territory, people with type II DM predominate, accounting for slightly more than 95.0%. The results of the age structure indicate the predominance of beneficiaries of people of the most working age, which increases the importance of organizing drug provision for this category of patients.

A comparative analysis of the age and gender structure showed a predominance of men among beneficiaries with type I DM, and a predominance of women among patients with type II DM, whose proportion is over 65.0%. Among patients with type I DM, people aged 30 to 60 years predominate. Patients with type II DM, people aged 60 to 80 years predominate, while the proportion of this group tends to increase, and the proportion of beneficiaries aged 30 to 60 years also increases. Thus, in a study by J.M. Clements et al. (2012), conducted in one of the states of the USA, it was noted that women receiving treatment are more likely than men to suffer from type II DM — 197,571 (44.1%) men versus 250,836 (55.9%) women [33].

Grouping the beneficiaries by duration of the disease indicates the predominance of people with a disease duration of over 10 years; there is a slight but stable increase in life expectancy in patients with type I DM; the life expectancy of patients with type II DM remains practically stable, but below the target values indicated in the regional program “Combating DM in the Stavropol Territory.” One of the large-scale studies on life expectancy is the work of

¹⁴ Diabetes mellitus: new epidemiological data and mechanisms of progression in the focus of ADA 2025. Available from: <https://medvestnik.ru/content/medarticles/Saharnyi-diabet-novye-epidemiologicheskie-dannye-i-mehanizmy-progressirovaniya-v-fokuse-ADA-2025.html>. Russian

¹⁵ Diabetes global report 2000–2050. Available from: <https://diabetesatlas.org/data-by-location/global/>

¹⁶ Diabetes Rates by Country; 2025. Available from: <https://worldpopulationreview.com/country-rankings/diabetes-rates-by-country>

S. Kaptoge et al. (2023) [34]. When DM was diagnosed at the age of 30–39 years, the hazard ratio (HR) [95% CI] was 2.69 (95% CI 2.43–2.97); 2.26 (2.08–2.45) at the age of 40–49 years; 1.84 (1.72–1.97) at the age of 50–59 years, 1.57 (1.47–1.67) at the age of 60–69 years, and 1.39 (1.29–1.51) at the age of 70 years and older. Using mortality rates in the United States, a 50-year-old with DM died on average 14 years earlier when diagnosed at age 30, 10 years earlier when diagnosed at age 40, or 6 years earlier when diagnosed at age 50 than a person without DM. Using mortality rates in the EU, the corresponding estimates were made 13, 9, or 5 years earlier.

The distribution of beneficiaries by HbA_{1c} level, as an indicator of the effectiveness of hypoglycemic therapy, confirms the dependence on the type of DM and indicates an increase in the proportion of patients with a glycated hemoglobin level of up to 7.0%, and the failure to achieve the accepted target indicators.

An increase in the proportion of beneficiaries with high BMI values indicates possible negative consequences associated with complications in DM, which may constitute an independent scientific direction for studying complications in DM, and which must be taken into account when adjusting hypoglycemic therapy.

It has been established that BMI is closely related to the development of type II DM, and HbA_{1c}¹⁷ is an objective indicator of glycemic control [35]. A cross-sectional study involving 200 patients with type II DM was conducted. BMI and HbA_{1c} levels were recorded. Patients were divided into groups with normal weight (BMI < 25 kg/m²), overweight (25 ≤ BMI < 30 kg/m²), and obese (BMI ≥ 30 kg/m²). There was a significant positive correlation between BMI and HbA_{1c} level ($r = 0.45$, $p < 0.001$). In obese patients, the HbA_{1c} level was significantly higher (8.5 [7.8–9.0] %) compared to overweight patients (7.7 [7.2–8.1] %, $p < 0.01$) and normal weight patients (6.9 [6.4–7.5] %, $p < 0.001$). A graded relationship indicated deterioration in glycemic control with increasing BMI [36].

Type I and II DM is a serious disease that lasts a lifetime. Over the years, the prevalence of DM has increased worldwide, and it is classified as one of the leading causes of high mortality and morbidity. In

addition, DM creates a huge economic burden due to the costs of its treatment, and its complications from the disease are growing rapidly [37]. Traditional medicines for the treatment of DM, aimed at insulin secretion and increasing insulin sensitivity (SGLT-2 inhibitors and GLP-1 RA), cause undesirable side effects in patients and lead to non-compliance with the doctor's requirements, and, as a result, to the ineffectiveness of the treatment. In drug therapy with hypoglycemic drugs, it is important to reduce hypoglycemia, use SGLT-2 inhibitors and GLP-1 RA [38].

The identified changes in the ratio of prescriptions of groups and trade names of drugs in the structure of DM therapy necessitate a more detailed study of the use of oral hypoglycemic agents in DM therapy.

The obtained results of the characteristics of beneficiaries with DM can be used to improve the organization of preferential drug provision for patients with DM in combination with regional features of providing patients in this group.

Study limitations

The study used a significant proportion of the number of patients with DM, and the results obtained are reliable in the quantitative characterization of patients with DM. However, this study did not consider the entire system of drug provision for patients with DM in the Stavropol Territory and did not assess the quantitative and qualitative indicators of its implementation. The main complications of DM associated with increased BMI and duration of the disease were also not studied, and the nomenclature of oral hypoglycemic agents used in the therapy of beneficiaries with high HbA_{1c} values was not considered. The work includes data on the medical and social characteristics of beneficiaries, which in this case is an important aspect of understanding all aspects of drug provision for patients with type I and II DM in the Stavropol Territory.

CONCLUSION

A retrospective analysis of the beneficiary population based on the duration of the disease showed an increase in the proportion of patients with type 1 and type 2 DM with a disease duration of up to 5 years, which may be due to the timely organization of DM diagnosis. An increase in the number of patients with disease duration of more than 10 years indicates the availability of medical care and drug provision for patients with DM.

¹⁷ Use of Glycated Haemoglobin (HbA_{1c}) in the Diagnosis of Diabetes Mellitus: Abbreviated Report of a WHO Consultation. Geneva: World Health Organization; 2011. 2. Glycated haemoglobin (HbA_{1c}) for the diagnosis of diabetes. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK304271/>

In the analyzed period, there was a slight but stable increase in the life expectancy of beneficiaries with type 1 DM, while for patients with type 2 DM, it remains practically stable — about 73 years, which is higher than the life expectancy for type 1 DM. The results obtained are a positive factor and indicate a positive organization of medical care for patients.

A positive trend was noted in achieving a HbA_{1c} level of up to 7.0% for both beneficiaries with type 1 DM (the proportion of patients increased from 21.12% in 2020 to 23.92% in 2025) and for every third patient with type 2 DM, but at the same time, the results achieved are still below the target indicators of the

regional program “Fighting Diabetes Mellitus” and the Federal project “Fighting Diabetes Mellitus”.

A significant achievement is the trend of decreasing the proportion of patients with higher HbA_{1c} values — from 8.0 to 8.9 — for both patients with type 1 and type 2 DM. The results of studying the BMI level indicate the presence of obesity for every third beneficiary with type 1 DM and for almost 70.0% of beneficiaries with type 2 DM, which may negatively affect the functioning of organs and systems of the body, contributing to the development of DM complications. Changes were identified in the ratio of prescriptions of groups and trade names of drugs in the structure of DM therapy.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS CONTRIBUTION

Rosa I. Yagudina — conceptualization, data curation, formal analysis, writing — review & editing.
Olga L. Listova — data analysis and curation, validation, visualization, writing — original draft. All authors confirm that their authorship meets the international ICMJE criteria (all authors made a significant contribution to the development of the concept, conduct of the study and preparation of the article, read and approved of the final version before the publication).

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