

Content Analysis of Iodine-Containing Drugs in The Republic of Uzbekistan in 2021-2026

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Abstract: Objective: To evaluate the assortment structure and market dynamics of iodine-containing medicines available on the pharmaceutical market of the Republic of Uzbekistan between 2021 and 2026.

Methods: The study analyzed six consecutive editions of the State Register of Medicines of Uzbekistan using comparative, documentary, content, and mathematical-statistical methods with consideration of dosage forms, international nonproprietary names (INNs), manufacturers, and assortment indicators.

Result: The analysis identified a relatively limited assortment represented by two INNs (potassium iodide and iodine β -cyclodextrin), 28 fixed combinations with folic acid, vitamins, and minerals, 39 trade names, and 50 medicinal products. The renewal index decreased from 0.18 in 2021 to 0.04 in 2026, while the number of discontinued products exceeded the number of newly registered medicines in several years, indicating market consolidation and limited introduction of innovative iodine-containing products.

Conclusion: The findings highlight the necessity of expanding the assortment of iodine-containing medicines, particularly specialized products for children and pregnant women, as well as supporting sustainable market development through improved registration policies and stimulation of local pharmaceutical productio.

Keywords: Iodine deficiency diseases, content analysis, range, completeness, breadth, depth, update index.

Introduction: Iodine is an essential microelement required for the synthesis of thyroid hormones, which regulate metabolism, growth, and neurological function [1]. The International Council on Iodine Deficiency Disorders (ICCIDD), UNICEF and WHO recommend that the daily iodine intake be: 90 μg for preschool children (0 to 59 months); 120 μg for schoolchildren (6 to 12 years); 150 μg for adolescents (over 12 years) and adults; 250 μg for pregnant and lactating women [2]. Iodine deficiency leads to decreased production of thyroid hormones (T3 and T4), which causes enlargement of the thyroid gland (goiter), chronic fatigue, edema, weight problems, and mental retardation in children [3]. Iodine deficiency in pregnant women is associated with impaired fetal growth and development [4].

Iodine deficiency disorders (IDD), caused primarily by inadequate dietary iodine intake, represent all

consequences of iodine deficiency in a population that can be prevented by ensuring adequate iodine intake. According to ICD-11, iodine deficiency is the most common cause of preventable brain injury in childhood. Using WHO thresholds of more than half the population excreting $>100 \mu\text{g}/\text{l}$ iodine and $<20\%$ of the population excreting $<50 \mu\text{g}/\text{l}$, data from the National Health and Nutrition Examination Survey (NHANES) III were interpreted as evidence that iodine status in the US population is adequate [5]. In the LIFE-Child epidemiological study conducted in Leipzig and its surroundings (Germany), 1802 healthy children and adolescents aged 0.25 to 18 years were examined. In 61.39% of boys and 65.91% of girls, the iodine level was $<100 \mu\text{g}/\text{l}$ (57%, 67%, 65% in the age groups 0–5, 6–12 and 13–18 years), the median iodine excretion was 86 $\mu\text{g}/\text{l}$ in boys and 80 $\mu\text{g}/\text{l}$ in girls [6].

The first nationwide survey in Korea found that the

median urinary iodine concentration and estimated iodine intake were approximately 300 µg/l and 250 µg/day, respectively, indicating excellent overall iodine nutrition. The prevalence of iodine deficiency and excess was 14.0% and 13.4%, respectively [7]. In China, after 20 years of universal salt iodization, an epidemiological study covering 31 provinces found that the mean iodine load in school-aged children was 199.75 µg/l, and the prevalence of goiter was 3.50% [8]. The prevalence of goiter among Chinese girls aged 8 to 10 years was 2.24%. [9]. The overall prevalence of thyroid disease in Hainan province was 27.01% [10]. Data from a population-based study on IDD in India showed a slight decline in the overall prevalence rate of goiter from 14.8% in 2017 to 12.6% in 2022 [11]. Among 2,700 schoolchildren in North Kashmir, 255 (9.44%) had grade 1 goiter and 17 (0.63%) had grade 2 goiter, yielding an overall goiter prevalence of 10.1%. The prevalence of goiter was higher in girls (11.2%) than in boys (9%). The highest overall prevalence of goiter was observed in 10-year-old children (14.4%) [12].

A systematic review of international and Russian literature revealed that of 19 studies, only three reported data on non-pregnant women (47–127 µg/l), with two reporting mild or moderate iodine deficiency. In 15 studies of pregnant women (18–45 years old), urinary iodine levels ranged from 33–192 µg/l, with many values below WHO recommendations, raising serious concern [13]. Despite the fact that the number of new cases of various forms of goiter has decreased during the observation period, the prevalence of goiter among the population of the Russian Federation remains high: 1.2% of the population as of January 1, 2019 [14]. In the Chechen Republic, diffuse goiter was detected in 16.4% of children examined, with the frequency of goiter ranging from 11.3% to 23.5% [14]. Data from 23 African countries up to 1995 showed that severe iodine deficiency was common during pregnancy, with a median urinary iodine concentration (UIC) of 28.6 µg/l. By 2005, five studies found a trend toward improved iodine status during pregnancy, with a median UIC of 174.1 µg/l [15]. For example, despite the fact that national IDD control programmes were initiated in Sudan more than 25 years ago, the prevalence of goiter among children (42.8%) in South Kordofan State remains alarming [16].

In May 2007, the Law of the Republic of Uzbekistan “On the Prevention of Iodine Deficiency Diseases” was adopted [17]. According to ioduria data, normal ioduria values (100–300 µg/l) were observed in 5.6% of the population in 1998 and 77% in 2016. The optimal level of iodized salt consumption (15.0–55 µg/g potassium iodate) was 7.6% in 1998 and increased to 81% in 2016 among the population. The prevalence of endemic

goiter decreased from 70% in 1998 to 31% in 2016 among the population of the Republic of Uzbekistan [18].

In 1952, the WHO recommended iodization of all table salt in iodine-deficient areas [19]. Prevention of iodine deficiency through salt iodization is recognized as a successful global achievement [20, 21]. Currently, more than 120 countries have implemented salt iodization policies, and at least 97 countries have adopted laws, regulations, or food safety standards to support salt iodization [22]. If such a global approach to improving iodine intake is not feasible, women of reproductive age are advised to take iodine supplements continuously, beginning at least three months before conception and continuing throughout pregnancy and breastfeeding [23]. However, in high-risk groups for developing IDD, group and individual iodine prophylaxis should be implemented using medications containing a fixed, physiological dose of iodine. These include children, adolescents, pregnant and lactating women, and individuals of childbearing age. Due to physiological processes, their iodine requirements increase significantly, and they require mandatory regular intake of this micronutrient [24, 25]. This determined the aim of the study – to analyze the range of iodine-containing drugs used in iodine deficiency diseases in the pharmaceutical market of Uzbekistan in 2021–2026.

METHODS

The State Registers of Medicines of the Republic of Uzbekistan for 2021 No. 25; 2022 No. 26; 2023 No. 27; 2024 No. 28; 2025 No. 29; 2026 No. 30 were used as the object in the analysis process [26]. Additional sources of information included the International Classification of Diseases, Tenth (ICD-10) and Eleventh (ICD-11) revisions [27], national clinical protocols and standards in endocrinology [28]. The study used methods of mathematical and statistical analysis, documentary research, content analysis, comparative analysis taking into account dosage forms, composition and manufacturers.

To achieve this goal, a research design was developed, which included 3 stages [29]: 1) retrospective studies of the structure of the range of iodine-containing medicines in 2021–2026; 2) study of the dynamics of renewal of the pharmaceutical market of iodine-containing medicines for 2021–2026; 3) analysis of development trends in the pharmaceutical market of iodine-containing medicines.

At the first stage, marketing monitoring of the pharmaceutical market for iodine-containing medicines was carried out for 2021–2026 using assortment analysis indicators in accordance with the

methodology proposed by prof. N. B. Dremova [30].

At the second stage, the dynamics of registration of new trade names (TN) and dosage forms (DF) of iodine-containing drugs was studied, and the degree of market novelty as of 2026 was determined.

At the third stage, macro-contours of the range of iodine-containing medicines for 2021–2026 were formed, and development trends in the pharmaceutical market for iodine-containing medicines were identified.

The assortment coefficients were determined using the following formulas:

Completeness coefficient: $C_c = \text{Actual number of product items} / \text{basic (standard) number of items}$;

Breadth coefficient: $C_b = \text{Actual number of groups} / \text{Total number of possible}$

Depth coefficient: $C_d = \text{Number of items in a group} / \text{Number of groups}$

RESULTS

The domestic pharmaceutical market for iodine-containing medicines from 2021 to 2026 showed a limited product range, represented by two INNs (potassium iodide and iodine- β -cyclodextrin), 28 combinations with folic acid, vitamins, and minerals, 39 trade names, and 50 products. Over these six years, potassium iodide preparations accounted for the majority (98.0%) of the iodine-containing medicines range (Fig. 1).

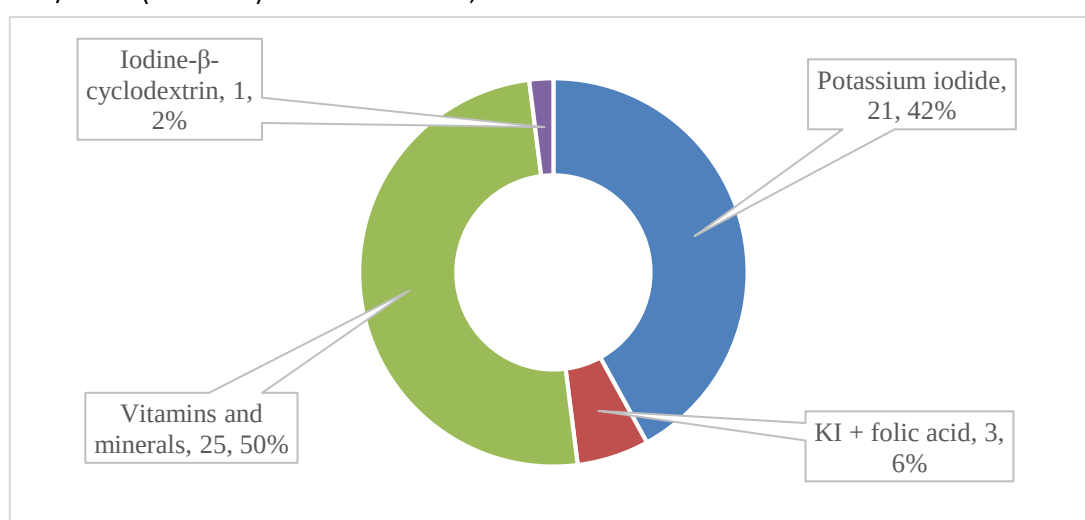


Fig 1. Variability in the structure of the range of iodine-containing medicines

Among them, the most common were vitamin and mineral complexes (A11A-Vitamins and Minerals) – 25 items (50.0% of the total assortment), indicating a high demand for combination prophylactic agents aimed at replenishing micronutrient deficiencies. Potassium iodide monoprparations (H03C-Iodine Preparations) were second in prevalence and were represented by 21 items (42.0%). Combinations of potassium iodide with folic acid were significantly less common – only 3 products (6.0%), despite their potential importance for pregnant women and women of reproductive age. Iodine- β -cyclodextrin was represented by only one item (2.0%), indicating a limited presence of alternative forms of iodine-containing medicines on the pharmaceutical market. In general, the assortment structure was characterized by a pronounced

predominance of potassium iodide preparations and the dominance of combined vitamin-mineral complexes, which reflects the preventive focus of the iodine-containing medicines market.

An analysis of the structure of iodine-containing medicine manufacturers for 2021–2026 (Table 1) revealed significant changes in the ratio of domestic and foreign products. From 2021 to 2023, foreign manufacturers dominated the pharmaceutical market, with a share of 48.7%, 54.5%, and 50.0%, respectively, while the share of domestic medicines ranged from 34.1% to 39.1%. Manufacturers from the CIS countries also remained present during this period, with their share gradually declining from 12.8% in 2021 to 10.9% in 2023.

Table 1.

Analysis of the registration of iodine-containing drugs for 2021-2026 by manufacturer

Manufacturers	Manufacturers											
	2021		2022		2023		2024		2025		2026	
	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%

Domestic	15	38,5	15	34,1	18	39,1	17	47,2	13	50,0	12	50,0
Foreign	19	48,7	24	54,5	23	50,0	16	44,5	13	50,0	12	50,0
CIS	5	12,8	5	11,4	5	10,9	3	8,3	-	-	-	-
Total	39	100	44	100	46	100	36	100	26	100	24	100

Beginning in 2024, a trend toward an increase in the share of domestic producers was observed, reaching 47.2% and reaching 50.0% in 2025–2026, equaling the share of foreign products. At the same time, a decrease in the total number of registered medicines was observed—from 46 names in 2023 to 24 in 2026, which may indicate product line consolidation and market optimization.

Of particular note is the complete absence of products from CIS manufacturers in 2025–2026, indicating a shift in the structure of imported supplies and a market redistribution in favor of domestic and international manufacturers. Overall, the results demonstrate a

gradual strengthening of the local pharmaceutical sector's position against a backdrop of a reduction in the overall range of iodine-containing products.

An analysis of the iodine-containing products by dosage form for 2021–2026 (Table 2) revealed a consistent dominance of tablet forms, with a pronounced upward trend in their share. While tablets accounted for 46.2% of the assortment in 2021, by 2026 their share had increased to 83.3%, accompanied by an increase in the absolute number from 18 to 20 items. The most significant increase was observed in 2024–2026, when tablets became the primary dosage form on the market.

Table 2.

Analysis of the registration of iodine-containing medicines by dosage form for 2021–2026

Dosage form	2021		2022		2023		2024		2025		2026	
	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%
Tablets	18	46,2	21	47,7	25	54,3	24	66,7	19	73,1	20	83,3
Film-coated tablets	7	18,0	9	20,4	7	15,2	3	8,3	2	7,7	2	8,3
Chewable tablets	4	10,2	4	9,1	3	6,5	-	-	-	-	-	-
Capsules	4	10,2	4	9,1	4	8,7	4	11,1	3	11,5	1	4,2
Gelatin capsules	1	2,6	1	2,3	1	2,2	1	2,8	-	-	-	-
Syrup	4	10,2	4	9,1	5	10,9	3	8,3	1	3,7	1	4,2
Drops	1	2,6	1	2,3	1	2,2	1	2,8	-	-	-	-
Total	39	100	44	100	46	100	36	100	26	100	24	100

The share of film-coated tablets, on the contrary, gradually decreased: from 18.0% in 2021 to 8.3% in 2026. A similar trend was noted for chewable tablets, which were present in the assortment in 2021–2023 (6.5–10.2%), but were completely absent starting in 2024. This may indicate a reduction in the range of specialized forms aimed primarily at the pediatric population.

Capsules and syrups maintained a relatively small market share throughout the observation period. Capsules' share varied from 4.2% to 11.5%, while syrups accounted for 3.7% to 10.9% of the product range. However, by 2025–2026, a decline in the absolute number of these forms was observed, reflecting the overall trend toward a reduction in the diversity of dosage forms.

Gelatin capsules and drops were represented by single names and completely disappeared from the assortment by 2025. Overall, during the study period, the total number of registered drugs decreased from 39 in 2021 to 24 in 2026, which was accompanied by a pronounced unification of the assortment and market concentration mainly on traditional tablet forms.

To assess the degree of market saturation, the assortment completeness coefficient was calculated for 2021–2026. The maximum number of assortment items was recorded in 2023 — 46 items, while the completeness coefficient reached the highest value (0.92), indicating the most complete market saturation during the study period. In 2022, this indicator also remained high and amounted to 0.88 with 44 product range items. Starting from 2024, a tendency towards a

reduction in the product range was observed: the number of medicines decreased to 36 in 2024, 26 in 2025, and 24 in 2026. At the same time, the completeness coefficient decreased from 0.72 to 0.48, indicating a decrease in the degree of market saturation by almost half compared to 2023.

Since in 2021–2026 the range of iodine-containing medicines was represented by only two pharmacotherapeutic groups – “Iodine Preparations” and “Vitamins and Minerals”, the range breadth coefficient remained stable throughout the entire study period and amounted to 1.0, which indicates full coverage of available pharmacotherapeutic categories within the market segment under consideration.

An analysis of the product range depth of iodine-containing medicines for 2021–2026 revealed differences in dynamics between the “Iodine Preparations” and “Vitamins and Minerals” pharmacotherapeutic groups. The “Iodine Preparations” group held a leading position throughout the study period: the number of product lines increased from 19 in 2021 to 26 in 2023–2024, with the product depth coefficient reaching a maximum value of 1.00. However, by 2026, the number of products decreased to 20, and the product depth coefficient decreased to 0.77, indicating a gradual reduction in the diversity of this group. The opposite trend was observed for the “Vitamins and Minerals” group. The number of product lines increased consistently from 4 in 2021 to 22 in 2022, and the depth coefficient increased from 0.18 to 1.00, reflecting the active expansion of the combination product range. Despite a slight decline in 2025–2026 (depth coefficient 0.23–

0.18), this group maintained a high market presence.

An analysis of the dynamics of iodine-containing medicine assortment renewals for 2021–2026 revealed a gradual decline in new medicine registration activity amid an increase in the number of canceled registration certificates. The largest number of new drugs was registered in 2021—7 names, corresponding to a maximum renewal index of 0.18. From 2022–2024, this indicator consistently declined: the number of new medicines decreased from 5 to 2, and the renewal index decreased from 0.11 to 0.06. In 2025, no new medicines were registered, indicating a complete lack of product line renewal during this period. In 2026, only one new medicine was registered, and the renewal index remained extremely low—0.04, reflecting minimal innovative activity in the market.

At the same time, an increase in the number of cancelled medicines was observed: while in 2021–2022 their numbers were 2 and 0, respectively, in 2024–2025 the figures reached 12 and 10 names. In 2026, the number of cancelled medicines decreased to 4, but continued to exceed the number of new registrations.

The macro contour of the range of iodine-containing medicines in the Republic of Uzbekistan for 2021–2026 was characterized by the dominance of potassium iodide preparations, the number of which increased from 23 names in 2021 to a maximum of 45 in 2024, after which it decreased to 39 in 2026. Iodine- β -cyclodextrin was represented by only one drug throughout the entire period and was completely absent in 2026, which indicates the extremely limited use of alternative iodine-containing compounds in the pharmaceutical market (Fig. 2).

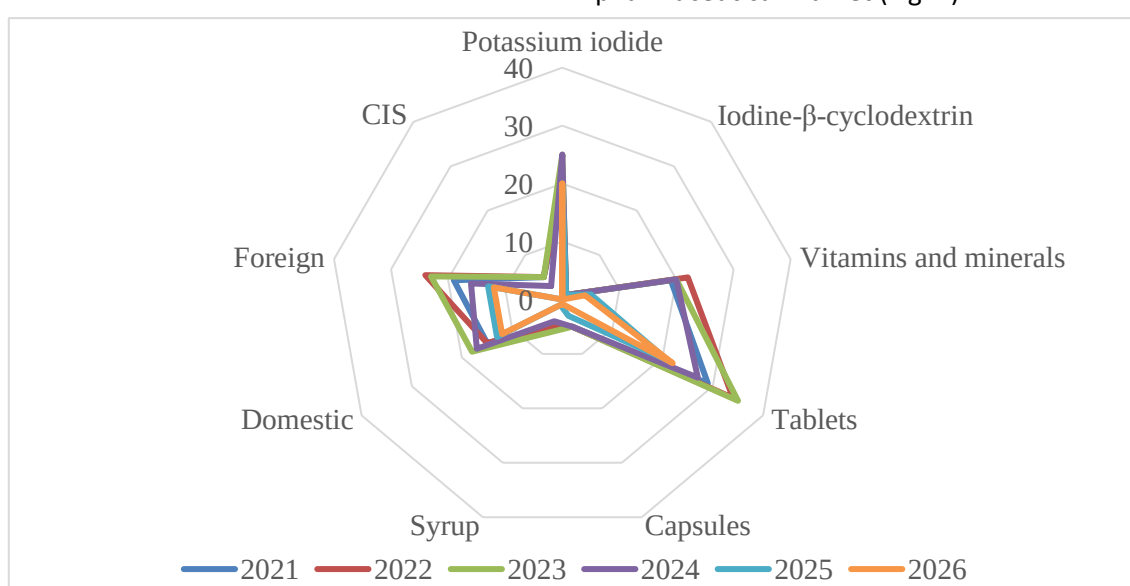


Fig 2. Macro contour of the range of iodine-containing medicines in the Republic of Uzbekistan for 2021–2026

The dosage form structure was characterized by a stable predominance of tablets: their number increased from 29 in 2021 to 35 in 2023, and then

decreased to 22 in 2026, while maintaining their leading positions in the product range. Capsules and syrups were represented by a significantly smaller

number of medicines and showed a downward trend: the number of capsules decreased from 5 to 1, and syrups from 5-6 to 1, indicating a decrease in the diversity of specialized forms, particularly those aimed at the pediatric population.

An analysis of the manufacturer structure revealed that foreign manufacturers predominated in 2021–2023 (19–24 products), but starting in 2024, a gradual equalization of the shares of domestic and imported medicines was observed. The number of domestic medicines increased from 15 in 2021 to 18 in 2023, after which it decreased to 12 in 2026, while the number of foreign medicines decreased from 24 to 12, respectively. At the same time, a complete disappearance of medicines from CIS manufacturers was noted by 2025–2026, reflecting a change in the structure of imported supplies and the transformation of the pharmaceutical market.

In general, the macro contour of the iodine-containing medicines market demonstrated a tendency towards a reduction in product range diversity, a decrease in the number of specialized dosage forms and a decrease in registration activity, while maintaining the dominant position of potassium iodide preparations and tablet forms.

DISCUSSION

An analysis of the range of iodine-containing medicines on the pharmaceutical market of the Republic of Uzbekistan for 2021–2026 revealed a limited diversity of international nonproprietary names, represented primarily by potassium iodide preparations and, to a lesser extent, iodine β -cyclodextrin, with combined vitamin-mineral complexes dominating. Despite relatively stable indicators in 2021–2023, a subsequent reduction in the range may reflect processes of optimization of the registration portfolio, market consolidation, or a reduction in the number of available iodine-containing medicines. Overall, the dynamics of the completeness coefficient demonstrate a gradual decrease in the diversity of the range in recent years of observation.

A trend toward strengthening the position of domestic manufacturers has been identified: while foreign medicines predominated in 2021–2023, by 2025–2026 the share of domestic and imported medicines equaled, reaching 50.0% each. At the same time, a complete disappearance of medicines from CIS countries from the market structure has been noted.

A comparison of the indicators reveals a gradual strengthening of the role of vitamin and mineral complexes in the structure of the iodine-containing product range. While iodine preparations retained a dominant position in terms of the number of product

lines, they demonstrated a trend toward a decrease in product depth in the final years of the study. It was found that the product range structure was characterized by a predominance of tablet dosage forms, the share of which increased from 46.2% in 2021 to 83.3% in 2026, while specialized forms for children (chewable tablets, syrups, drops) gradually decreased or completely disappeared from the product range.

A comparison of two pharmacotherapeutic groups shows that during the study period, the market gradually shifted from iodine-based single-agent preparations toward combined vitamin-mineral complexes. The data obtained indicate a transformation in the assortment, with a predominance of preventative-oriented combination medicines and a simultaneous reduction in the diversity of traditional iodine-containing medicines.

The dynamics of the product range completeness and depth coefficients indicated a gradual reduction in the diversity of iodine-containing products in the final years of the study. Maximum market saturation was observed in 2022–2023, after which a decrease in the number of product lines, the completeness coefficient, and the renewal rate was observed.

Although it is common knowledge that iodine-containing medicines (iodine preparations, vitamins, and minerals) are primarily available over-the-counter, their instructions for medical use advise consulting a physician before use. In rare cases, chronic use of iodine-containing medicines can lead to the development of “iodism”, which can manifest as a metallic taste in the mouth, swelling and inflammation of the mucous membranes (runny nose, conjunctivitis, bronchitis), “iodine fever”, and “iodine acne”. In extremely rare cases, angioedema and exfoliative dermatitis may develop.

Active participation of all parts is essential for the sustainability of IDD prevention efforts. Optimization of iodine load for the most vulnerable population groups, including pregnant and lactating women, is also important [31]. Thus, as a result of the conducted research, recommendations were developed for optimizing the range of iodine-containing medicines:

1. Expand the range of iodine-containing medicines by introducing new international non-proprietary names and combination drugs aimed at the prevention and treatment of iodine deficiency conditions in various population groups.
2. Increase the availability of specialized dosage forms for children and pregnant women, including syrups, chewable tablets, drops, and preparations with physiologically adapted doses of iodine.

3. Stimulate the development and localization of production of domestic iodine-containing medicines in order to reduce import dependence and increase the sustainability of the national pharmaceutical market.
4. Increase the index of product range renewal by simplifying the registration of socially significant medicines, supporting innovative developments and expanding the participation of local manufacturers in the state pharmaceutical sector.
5. Optimize the product range structure based on regular marketing monitoring, epidemiological data on IDD and the needs of target population groups, especially children, pregnant women and women of reproductive age.
6. Strengthen the integration of digital channels for the distribution and monitoring of the availability of iodine-containing medicines, including online pharmacies and pharmaceutical platforms, to increase the availability of preventive measures in various regions of the country.

CONCLUSION

An analysis of the range of iodine-containing medicines in the Republic of Uzbekistan for 2021–2026 revealed a limited diversity of INNs, with a predominance of potassium iodide preparations and vitamin-mineral complexes, a predominance of tablet forms, and a gradual strengthening of the position of domestic manufacturers. At the same time, a decrease in the coefficients of completeness, depth, and index of product renewal, a reduction in specialized forms for children and pregnant women, and a decrease in registration activity were identified, indicating a trend toward consolidation and a narrowing of the iodine-containing medicines market.

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