Original Study

MARKETING RESEARCH ON DIETARY SUPPLEMENTS FOR PERIODONTITIS IN PATIENT DIABETES

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ABSTRACT

The vast majority of periodontal diseases are inflammatory and can develop under the influence of both local causes and the combined action of common (endogenous) and local factors against the background of changes in the reactivity of the body. In the pathogenesis of the development of periodontal diseases in patients with diabetes, the main role is given to angiopathies. Since periodontitis is characterized by various vascular disorders, which are largely similar to diabetic angiopathy, it is not easy to prove the presence of the latter with periodontitis. So some authors argue this, while, others deny it. The starting point of diabetic microangiopathies is a violation of carbohydrate metabolism, as well as a violation of glycosamine metabolism, which determines the functional and structural integrity of the vascular basement membrane.

Key words: producing countries, periodontitis, diabetes mellitus, dietary supplements, medicines, dentistry.

Introduction

Nowadays, the problem of treatment and rehabilitation of patients with periodontitis is quite actual, as there is an increase in morbidity among people of working age, increasing demands on appearance as a factor that plays an important role in professional and personal success in society. As a result of the chronic inflammatory process in periodontal tissues, such complaints as bleeding gums, halitosis, tooth loss, etc. are formed. These problems, in turn, affect the quality of life of the patient and his psychological state. An important problem today is periodontitis in patients with diabetes. Typically, statistics show that almost 80% [1-4] of patients with diabetes mellitus of various types suffer from periodontitis. According to the International Federation of Diabetes reports, there were 382 DM patients across the world in 2013 [5]. Diabetes is a chronic metabolic disorder that remains major worldwide health problem [6-8]. Diabetes mellitus (DM) is the predominant public health concern disorder that causes substantial mortality, morbidity and long term health complications [9]. Diabetes mellitus causes changes in the vascular walls of all body tissues (including the periodontium), which increases the risk of gum disease. This impairs microcirculation in small vessels of the periodontium, and as a result, the transport of oxygen, nutrients, and end products of metabolism.

Periodontitis in patients with diabetes forefront among the most common comorbidities of diabetes mellitus. According to the clinical recommendations of ESC/EASD [4] in diabetes, prediabetes, and cardiovascular disease, the use of vitamins and microelements is recommended to improve the treatment and prevention of such pathology, as periodontitis in patients with diabetes.

The search for modern drugs and perspective combinations of microelements for treatment, both internally and locally, using applications on periodontal tissues in patients with various types of diabetes, involves marketing analysis of the domestic pharmaceutical market of drugs and dietary supplements.

Research Materials and Methods:

The study used marketing methods of analysis and reference Literature - State Register of Medicines of Ukraine State expert center of the Ministry of Health of Ukraine, as well as a retrospective analysis of retail audit of the pharmaceutical market of Ukraine for the last 5 years and the audit of prescriptions for the treatment of periodontitis in patients with diabetes mellitus according to ICD 10.

The analysis was aimed at a detailed study of drugs and trace elements domestic pharmaceutical market according to the ATC (anatomical-.therapeutic chemical classification).

Results and Discussion:

The Ukrainian market has a large number of products that contain minerals (DD-dietary supplements). Some of them are registered as medicines means, other parts - as biologically active additives (DD-dietary supplements). The consumer has the opportunity to buy DD both in the pharmacy and in the supermarket and online. For analysis,

we took the pharmacy segment of mineral supplements, which is given below in Figure 1.

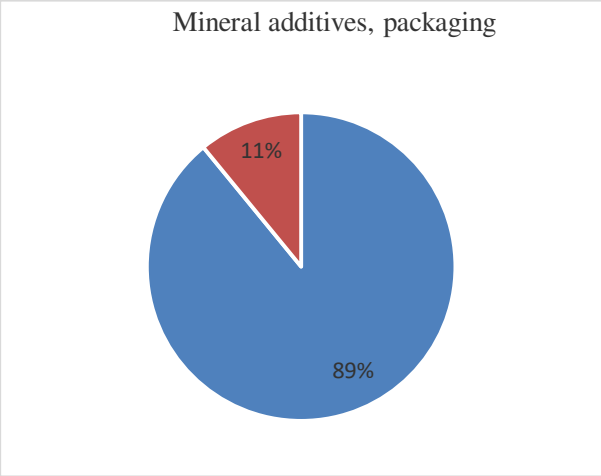

Fig. 1 Trace elements (DD-dietary supplements) in packages

According to Figure 1, we concluded that 89% are drugs and 11% dietary supplements (DD).

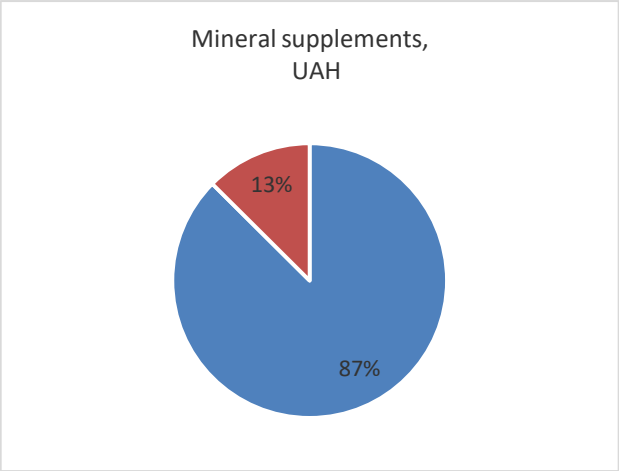

Fig. 2 Trace elements (DD-dietary supplements) in UAH

According to Fig. 2, we investigated that the total volume of the segment of mineral supplements is 10.8 million units and 809 million UAH per year, according to the results of sales in 2019. Mineral supplements, registered as dietary supplements, make up 11% of the segment in packaging and 13% in the money.

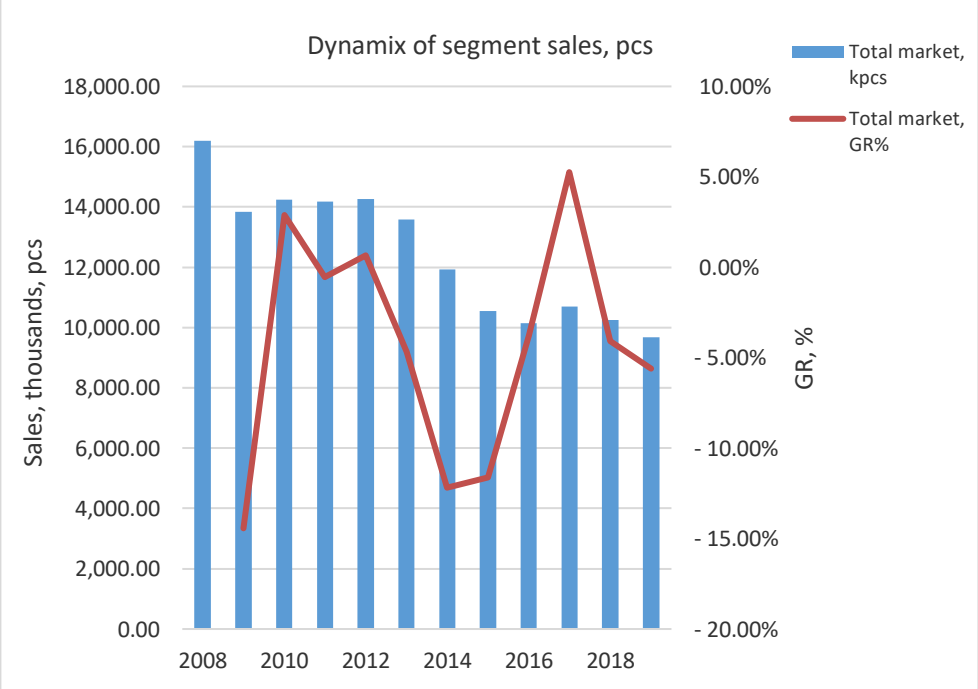

Fig. 3 Dynamics of the segment of drugs in the unitary enterprise in the period from 2008-2011

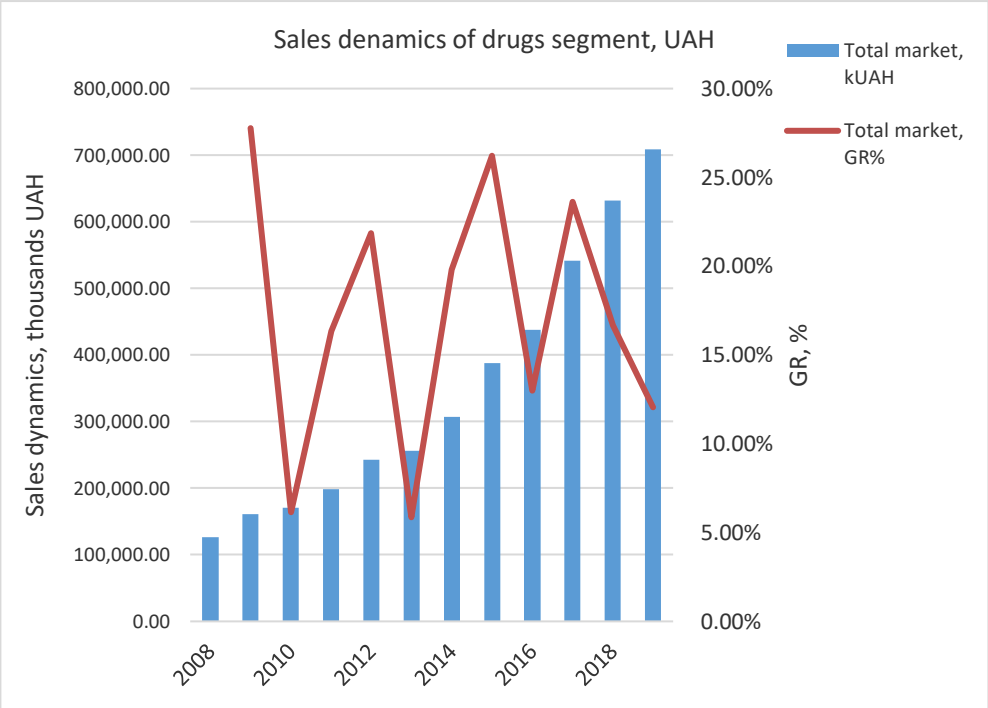

Fig. 4 Dynamics of the segment of drugs in UAH in the period from 2008-2019

According to Fig. 3 and Fig. 4, we concluded that the segment of mineral supplements registered as medicines has been declining in packaging since 2013 and is growing steadily in money.

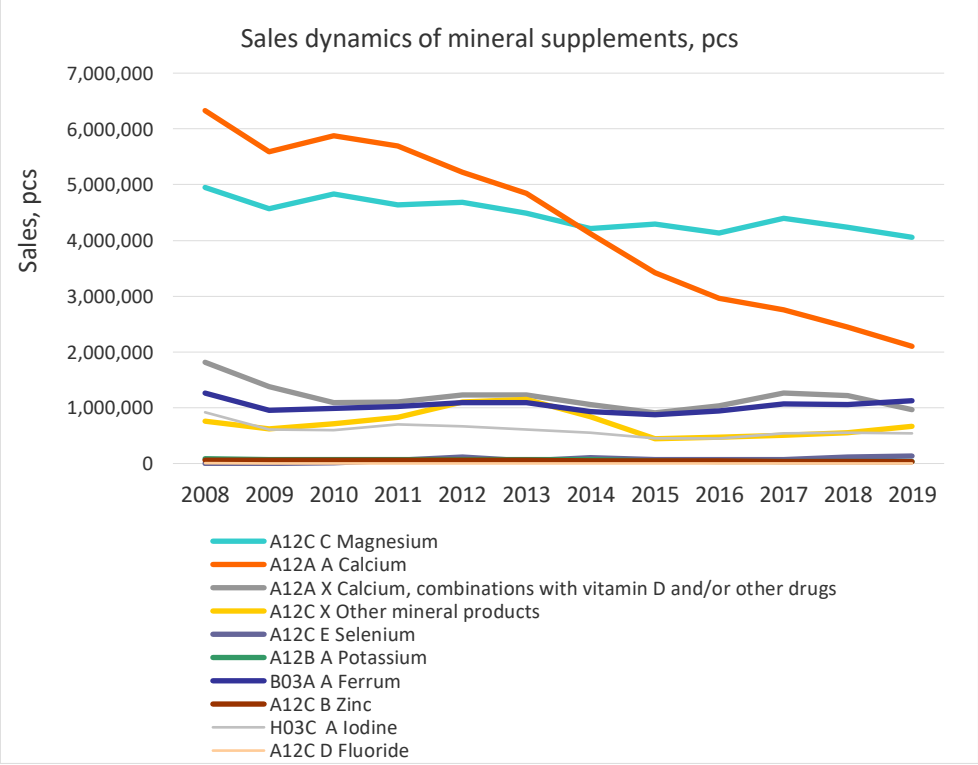

Fig. 5 Dynamics of sales of the DD segment in UAH in unitary enterprise from 2008-2019

According to Fig. 5, we found that the segment of dietary supplements shows stable growth in packaging since 2014, and is growing in money.

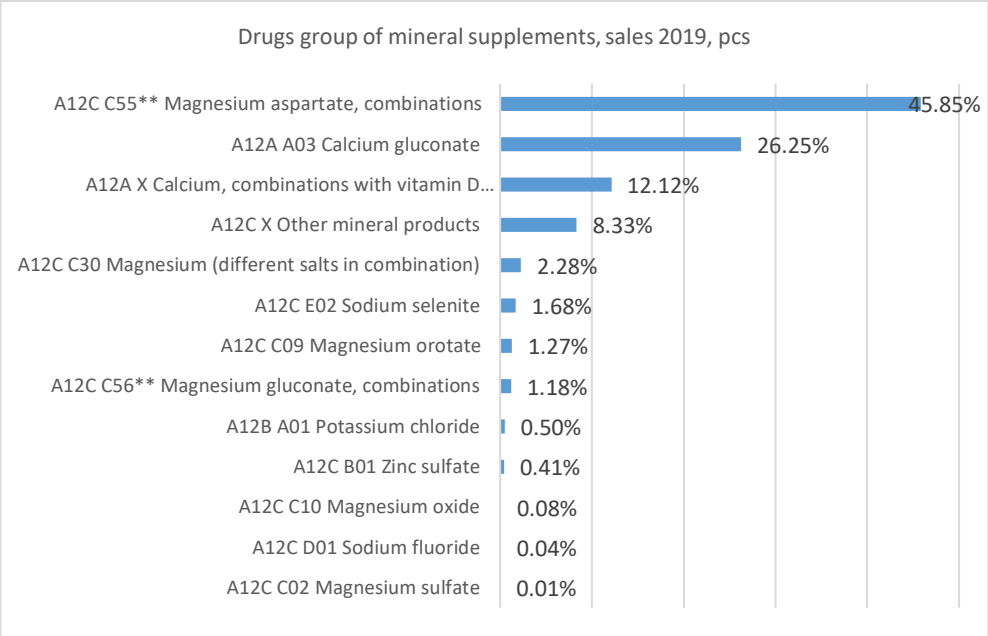

Fig. 6 Mineral additives-medicines, the structure of sales in 2019 in the unitary enterprise

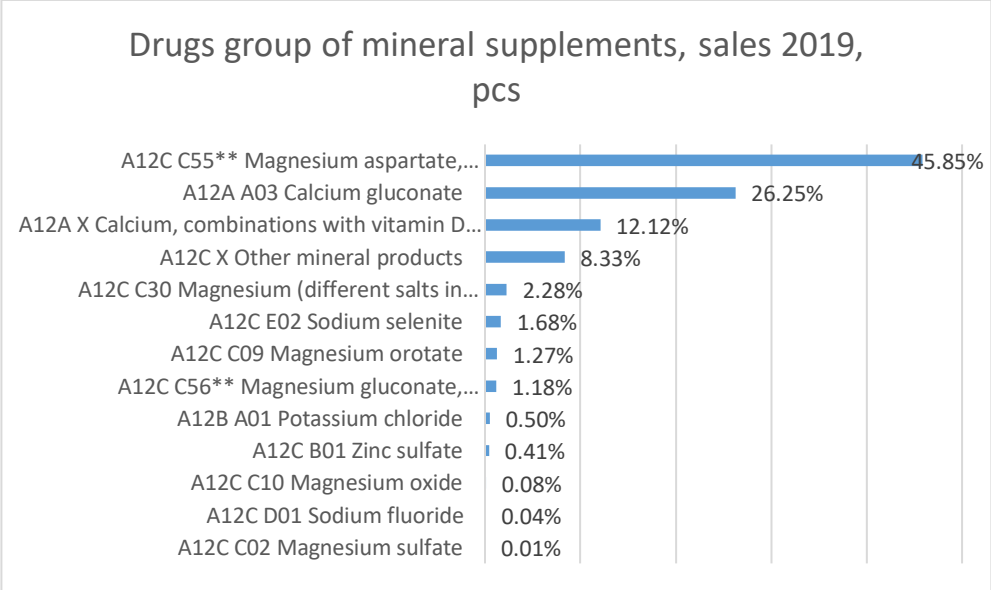

Fig. 7 Combinations of mineral DD sales structure in 2019

According to Fig. 7 we concluded that the range of mineral supplements in the segment of drugs and DD has some differences. In both groups, the most popular supplements are based on calcium (36% in the DD group, 22% in the drug segment) and magnesium (42% in the drug segment and 12.26% in the DD segment). The three most popular mineral supplements in the DD segment include selenium (23%), while in the drug segment it is only in 6th place [4]. The situation is the same with zinc-based supplements - it occupies about 9% in the drug segment and less than one percent in the drug segment. Approximately the same share in both segments is occupied by iodine preparations (about 5 percent). Iron preparations are more widely represented in the segment of drugs (11.6%), however, in the segment of DD occupy a significant share (4.3%). In general, the range of mineral supplements registered as DD is more diverse and includes those drugs that are not represented in the segment of drugs (silicon, chromium, silicon, copper, sulfur, etc.) [10].

Next, we consider in more detail separately the segments of drugs and DD. Drugs containing mineral supplements belong to 3 main PBX (anatomical-therapeutic classifications) groups. And 12 - mineral supplements,

from the category of drugs that affect the function of the digestive system. It includes most of the drugs. Iron supplements are under PBX code B03A in the category of drugs that affect the blood system and hematopoiesis. Iodine preparations belong to the group H03A in the category of agents that affect the hormonal system.

Group of mineral additives A12

If you look at the structure of sales of this group of supplements through the prism of the classification of the European Pharmaceutical Market Research Association (EPhMRA), it can be noted that the largest share in this segment is drugs used in diseases of the transect and cardiovascular system. The group "Miscellaneous", which includes other conditions and diseases, is very limited. This may indicate the potential for finding new drugs in this direction [11].

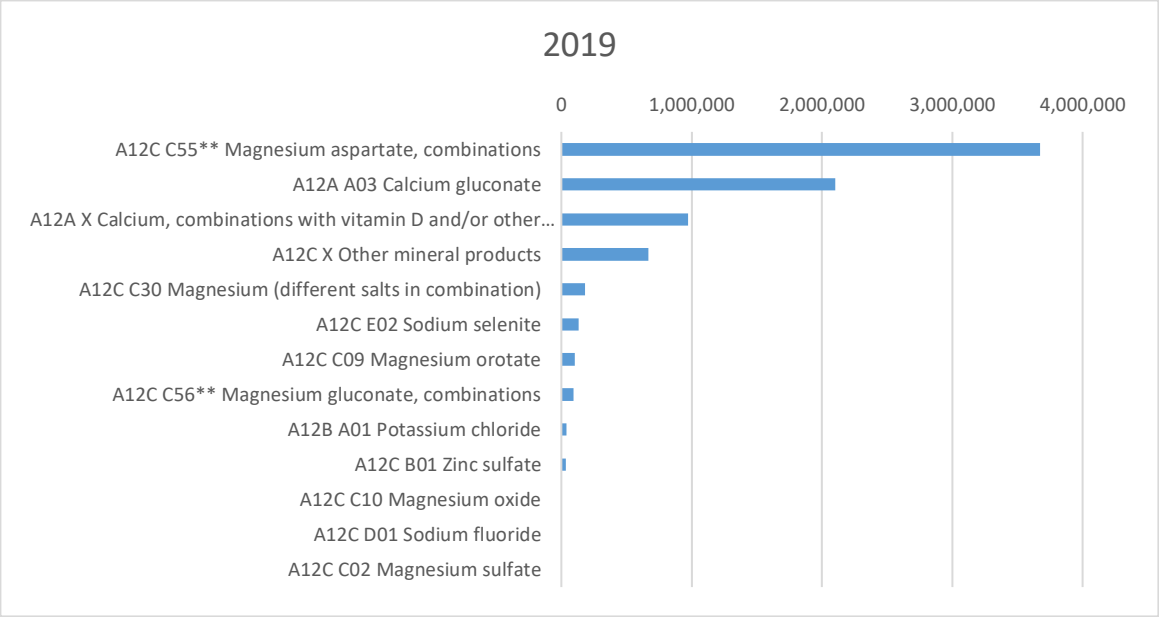

Fig. 8 Groups of mineral supplements of drugs by sales in 2019

According to Figure 8, we found that less than half of the sales group consisted of drugs based on magnesium aspartate (such as asparkam, panangin, and analogs). These drugs are used to maintain heart function in chronic heart disease, as well as to prevent potassium deficiency, for example, when using diuretics. Combinations of magnesium with vitamins often used to improve nervous system function. referred to another group - A11 (eg, Magne-B6) and are not reflected here. Preparations containing magnesium orotate are also used to maintain cardiovascular health. An interesting novelty is a tool based on magnesium oxide (Biolectra), which is indicated for a wider range of conditions in which there is a deficiency of magnesium - convulsions, stress, fatigue. The second and third position is occupied by calcium supplements, including vitamin D. These drugs are used primarily for maintenance of bone health, prevention, and treatment of osteoporosis, as well as many other conditions that are accompanied by the increased loss of calcium or increased need for it. The A12XX group includes panangin, Locksmith salts containing iron, magnesium, or potassium, and Beresh multicomponent drops. Sodium selenite is used in the treatment of soft tissue diseases of the periodontium, cardiovascular system, as well as some kidney and cancer diseases. Zinc preparations are represented by only 1 drug (Zincteral), but the potential of this mineral supplement is very wide - diabetes, other diseases of the pancreas, bulimia, anorexia, chronic infections, parasitic diseases, diseases of the intestines, kidneys, skin, stress, trauma, diet. And the latest recommendations (EPOS 2020) recommend it for the prevention and treatment of colds.

The segment of dietary supplements (BAA) as a source of minerals in the pharmacy segment. The segment of mineral supplements, registered as dietary supplements, today is inferior in terms of sales of the segment of medicines. But in contrast to the latter, it has a pronounced tendency to increase and is characterized by a wider range of additional sources of minerals listed below in Table 1.

Table 1 At the second level of classification of DD are divided into 16 groups

3.1.9. DD containing selenium
3.1.4. DD containing calcium
3.1.2. DD containing iodine
3.1.11. DD containing zinc
3.1.7. DD containing magnesium
3.2.4. DD containing a complex of micro- and macroelements
3.1.10. DD containing chromium (Active chromium etc)
3.1.1. DD containing iron (Active iron etc)
3.1.8. DD containing sulfur (Sulfur etc)
3.1.5. DD containing silicon (Silicone etc)
3.2.1. DD containing calcium and iodine (Active iodine etc)
3.1.12.DD containing separate micro- and macroelements (Mineral, etc)
3.1.6. DD containing copper (Active copper etc)
3.2.3. DD containing calcium, magnesium, and iron (Active iron, etc)
3.2.2. DD containing magnesium and calcium (Active calcium etc)
3.2. DD containing mineral complexes (Mineral etc)

According to Table 1, we found that as in the group of drugs, in the group of DD widely represented drugs of calcium, magnesium, iron, and iodine (sales of the latter are also declining). But in contrast to drugs in 2nd place (after calcium) in terms of sales are DD with selenium, and zinc drugs (in 4th place), while in the segment of drugs they are represented by single drugs. Also in the DD segment, you can find additional sources of sulfur, molybdenum, silicon, chromium, and interesting complex agents for example Minerol.

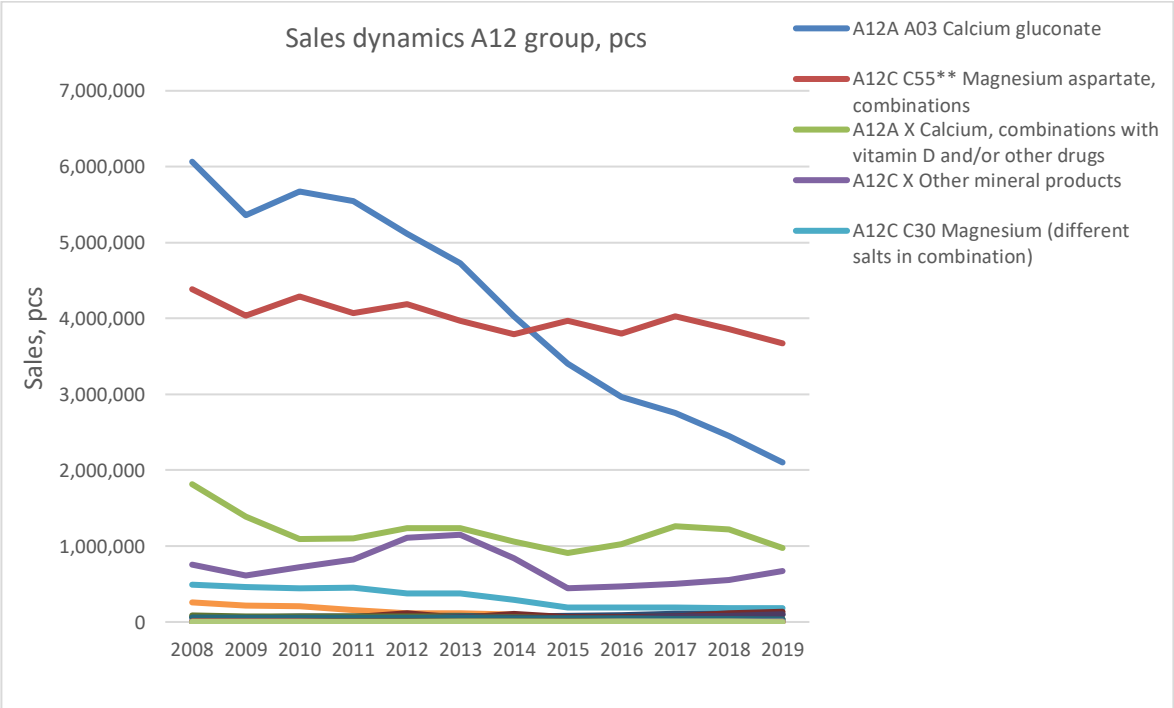

Fig. 9 Dynamics of sales of DD according to the second level of classification

We analyzed Figure 9 and Figure 10 and concluded that the most pronounced growth is shown by DD with calcium, also, the positive dynamics are shown by DD of magnesium, selenium, and zinc, some growth - iron supplements and complex products containing several mineral supplements. DD with iodine fall.

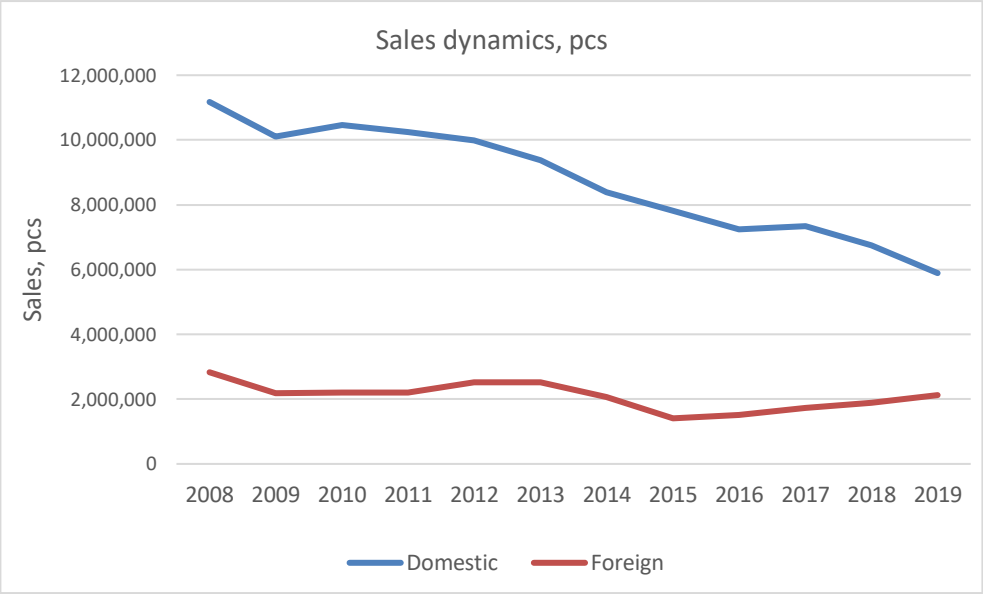

Fig. 10 Sales volumes of producer countries in the period 2008-2019 in unitary enterprise

Analysis of the data in Figure 10 showed that today the market is led by domestic manufacturers, which increase sales. For a short time, foreign producers were in the lead, but the situation changed dramatically after 2014, partly because Russian producers were no longer able to supply products to Ukraine. Manufacturers from Italy, Estonia, Turkey, Spain, Canada, Bangladesh, the Netherlands, France, and Denmark account for a small share of sales. Given this structure of sales, foreign manufacturers have a significant advantage in the market of iodine preparations. However, domestic producers have a certain tendency to increase the share of packaging. When analyzing the pricing policy, it can be noted that domestic iodine drugs are much more affordable for the patient (4-5 times). This may indicate that the search for new and available mineral supplements and their combinations will increase the level of therapeutic efficacy for the treatment of periodontitis in patients with diabetes [3].

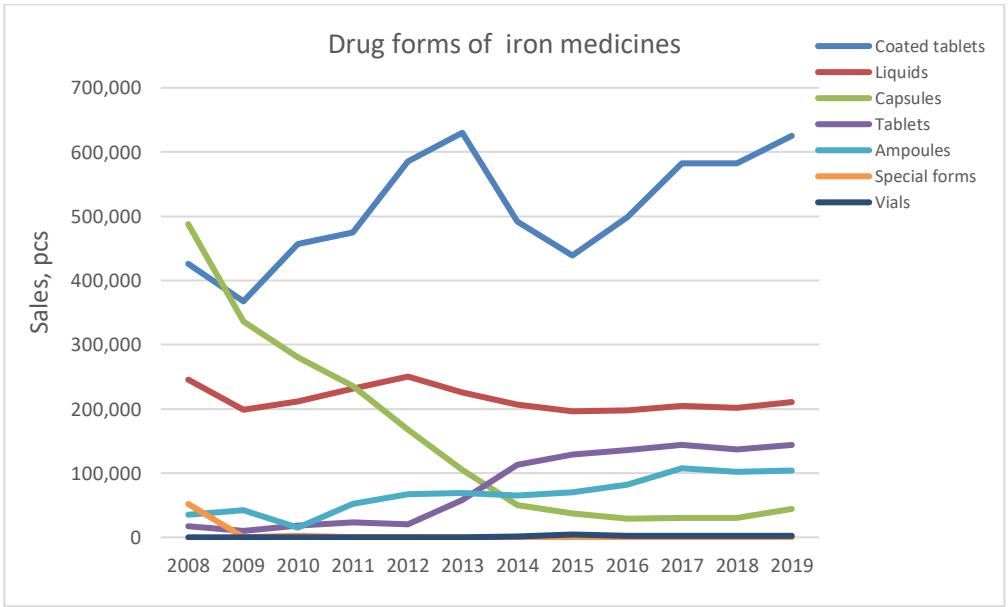

Fig. 11 Group 3.1.1. - DD containing iron

According to Fig. 11, we concluded that the segment of DD with iron is actively growing since 2014. During this time, it has grown almost 50 times.

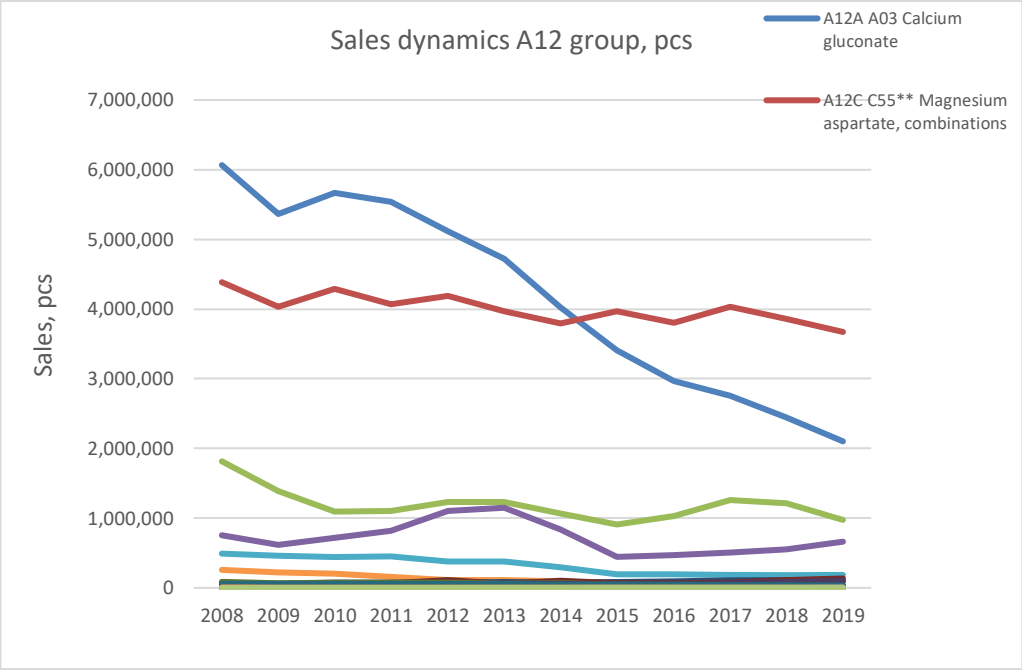

Fig. 12 Dynamics of sales of DD containing iron in the period 2008-2019 in unitary enterprise

According to Figure 12, Fersinol, which is the leader of the segment, was also represented in the drug segment in 2017-2019, but in the DD segment was much more successful. Contains a combination of 2-valent iron with a complex of vitamins, which in turn is a clinical recommendation of ESC / EASD in diabetes, prediabetes, and cardiovascular disease to improve the treatment and prevention of this pathology as periodontitis in patients with diabetes. Over the last 4 years, the number of brands in the segment has significantly increased from 3 to 12. Most of them are over-the-counter drugs. Prescription drugs include, for example, zincteral, injectable forms of calcium gluconate and panangin, and so on.

INPN	2015	2016	2017	2018	2019
Potassium-magnesium asparagine	4595636	4442158	4698803	4573165	4492908
Calcium gluconate	3405743	2966565	2757624	2448223	2102028
Minerol	567326	644803	824671	883665	948388
Calcium glycerophosphate	19955	1066	45	0	0
selenium	65184	66027	70436	112753	134576
Potassium chloride	44105	40212	37503	36489	40104
Magnesium orotate	43235	50083	69459	83017	102006
Zinc sulphate	44176	44610	40586	34935	32986
Sodium fluoride	3437	3492	1981	3135	3419
Magnesium oxide	814	4612	6098	8338	14931
Magnesium sulfate	2191	1868	1009	776	411
Total	**8 791 800**	**8 265 497**	**8 508 215**	**8 184 496**	**7 871 758**

Table 1 Subgroup A12 is represented by international non-proprietary names (INN)

According to Tab. 1, we concluded that subgroup A12 is represented by 11 INNs. Sales of calcium gluconate, calcium glycerophosphate, zinc sulfate, magnesium sulfate are falling. Hold the positions of silicon, potassium-magnesium asparagine, potassium chloride, sodium fluoride. Selenium, magnesium orotate, magnesium oxide grow [10, 11].

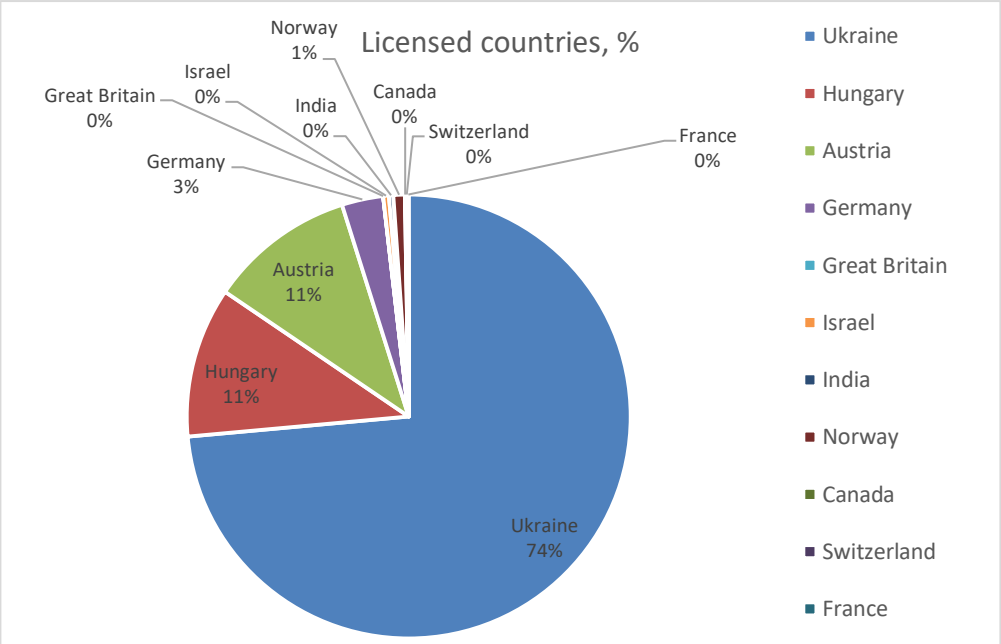

Fig. 13 Producing countries of DD containing iodine in the period 2008-2019 in unitary enterprise

According to the data of Figure 13, we concluded that in this segment prevail DD of domestic production, which retains the leadership throughout the analysis period. The share of domestic producers is only 8.3% as of 2019. Today, DDs of Ukrainian production and the USA are represented on the market, DDs from Russia are almost absent, in certain periods DDs made in the Czech Republic and Estonia were presented.

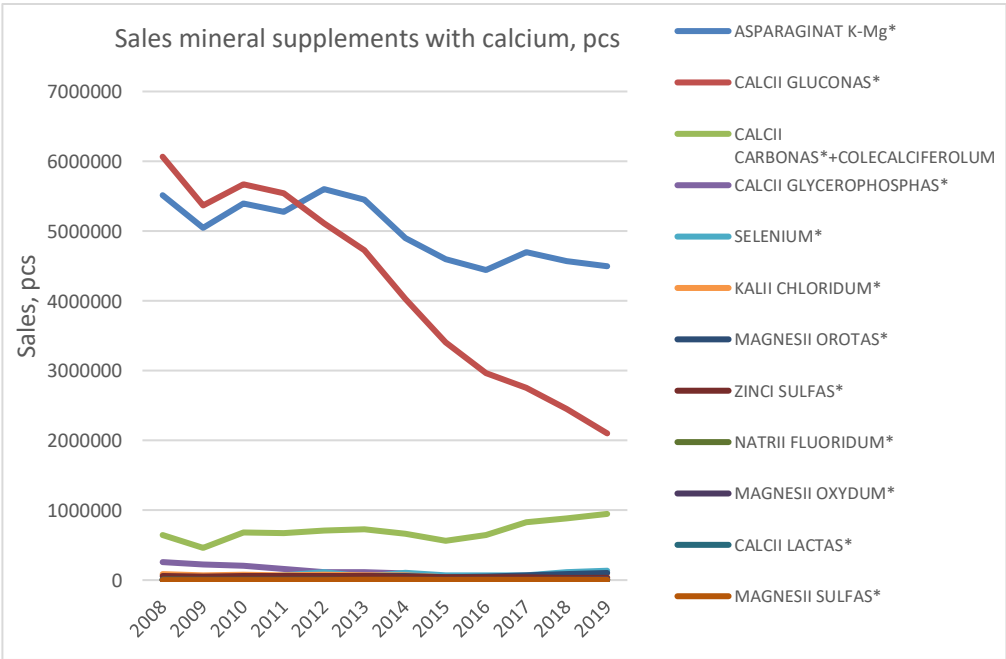

Fig. 14 Dynamics of sales of DD with calcium in the period 2008-2019 in unitary enterprise

Analysis of the data in Figure 14 showed that the segment of DD containing calcium has shown rapid and stable growth since 2013. The fastest growth rates were observed in 2013-2014, as well as 2017-2019. Since 2012, this increase was provided by Calcemin (Bayer), which won a good position in the drug segment and released an additional form in the DD segment (citro-calcemin). And since 2016, intensive growth has also provided Calcium gluconate of domestic production (Zdravopharm). Calci-M from Tulip Lab was also previously in the segment of

drugs, then moved to the segment of DD. But for him, this move was not so successful (perhaps due to less promotional activity and less knowledge of the brand among consumers). In different years, 38 brands were represented in the segment (one of the widest groups of DD groups), currently, 20 brands retain active sales. However, the first 2, calcemin, and calcium gluconate are 82% in packages.

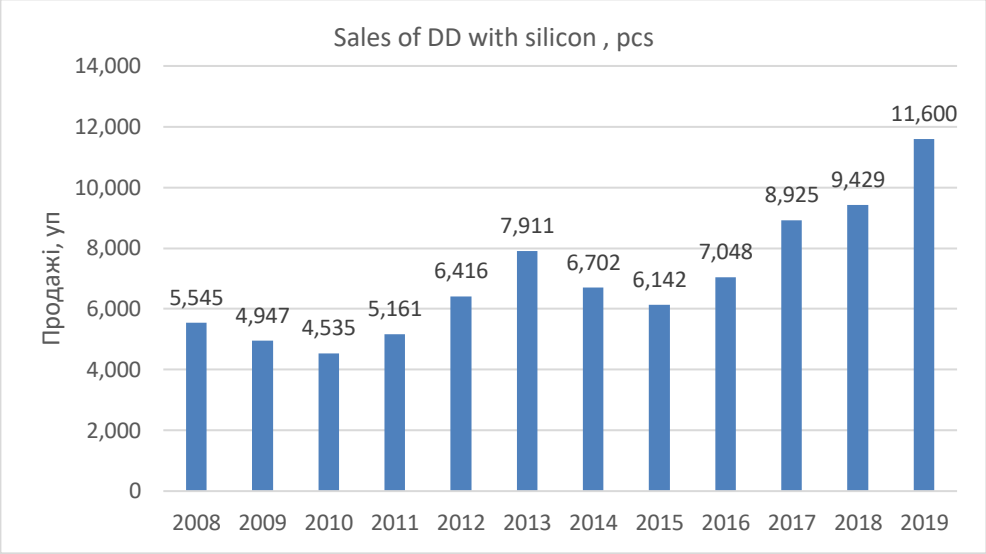

Fig. 15 Dynamics of sales of DD with silicon in the period 2008-2019 in unitary enterprise

Analysis of the data in Figure 15 showed that the DD segment containing silicon has a pronounced upward trend. DD with silicon is used to treat periodontitis both locally and internally, to prevent diseases of bones, cartilage, skin and connective tissue in the first place, it is needed for collagen synthesis, and stimulates some immune processes and slows down the aging process. There are no such drugs among medicines. Today the segment is represented by a single brand - Active silicon of Ukrainian production, DD contains silicon, calcium, vitamins B 1, B2, B6, B9, vitamin E, and vitamin D3. It should be noted that the available silicon in combinations of mineral supplements, such as Minerol. DD contains silicon, calcium, vitamins B 1, B2, B6, B9, vitamin E, and vitamin D3.

Data analysis Figure 16 showed that in 2019 this segment of DD is represented by 2 brands - Copper active (Ukraine) 59% and Minerol (Ukraine).

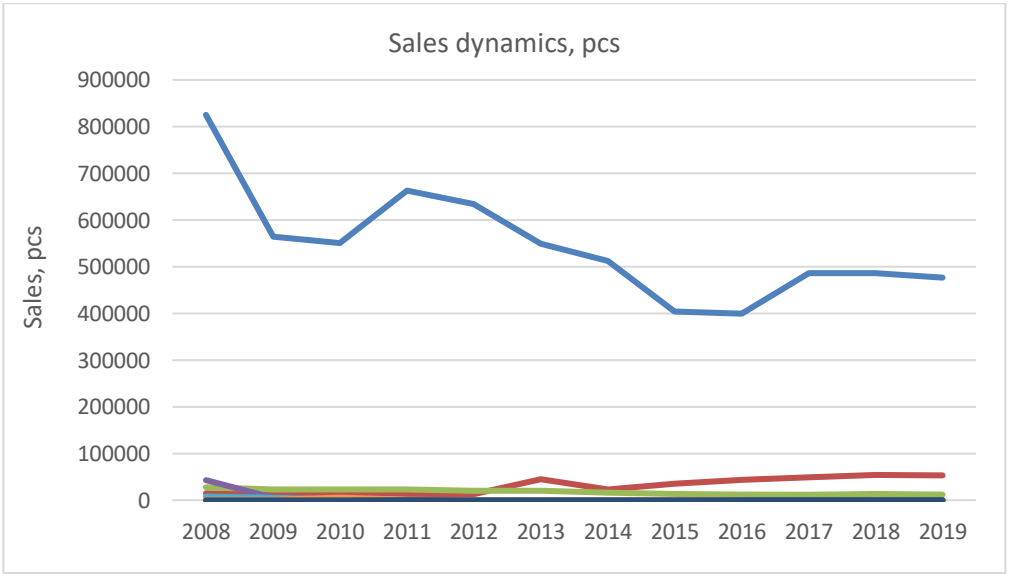

Fig. 16 Sales dynamics brands Copper active and Minerol

The compositions include copper asparagine, iron fumarate, vitamin B9, vitamin C, etc. Copper is one of the vital trace elements, increases the body's defenses, improves the function of the adrenal glands by participating in the synthesis of catecholamines, promotes the transmission of nerve impulses, brain, and heart. Together with iron is involved in the formation of red blood cells. Brand Minerol protects cells from damage, prevents the formation of free radicals. Regulates blood sugar levels, participates in the production of thyroid hormones (thyroxine), in the formation of connective tissue, which forms the basis of the musculoskeletal system, skin. Minerol has pronounced anti-inflammatory properties, alleviates the course of autoimmune diseases. DD data are not presented in the segment of drugs, but there is a tendency to increase.

Conclusions

As a result of our study of the domestic pharmaceutical market, it was found that the range includes both drugs and mineral dietary supplements, because it is the sales of DD are growing, and the range is more diverse. Among the manufacturers are both domestic and foreign manufacturers, it should be noted that domestic drugs and DD are often more accessible to consumers. At the same time, the range of mineral supplements available in the pharmacy segment requires the expansion and creation of new combined agents. Currently, the demand for silicon, calcium, magnesium, selenium, chromium, and other mineral supplements speaks of the quality and increase of therapeutic efficacy in patients with various pathologies. The potential of mineral elements is used in the treatment and prevention of diseases in the therapeutic business of the dentist because inflammatory processes in the oral cavity are primarily a deficiency of certain trace elements, which in turn leads to periodontitis, tooth loss, and more. Particular attention should be paid to patients with diabetes because we concluded that this group of patients in 80% [3] cases suffers from periodontitis and in critical conditions leads to tooth loss. The conducted marketing analysis of the data shows that the use of mineral components for the treatment and prevention of periodontitis in patients with diabetes requires an axiom of treatment both locally in the form of applications and internally. Correction of manifestations of "disease of civilization" - diabetes will help zinc (involved in both exocrine and endocrine function of the pancreas, including the secretion of glucagon, activation of digestive enzymes, insulin secretion), potassium (its level is associated with the level insulin in the blood - insulin is an important regulator of potassium homeostasis because it prevents its buffering in cells), copper (diabetes often has a copper deficiency, which can lead to increased glucose levels and increased insulin resistance, and copper, due to reduced formation of free radicals reduces the risk of diabetic nephropathy, retinopathy and nephropathy), magnesium (is a cofactor of more than 300 enzymes involved in carbohydrate metabolism, magnesium deficiency provokes insulin resistance and is considered a factor associated with the development of), chromium (chromium deficiency is associated with hyperglycemia, increased insulin resistance and dyslipidemia - One hundred in type 2 diabetes in combination with obesity, its deficiency can be observed in people who consume excessive amounts of digestible carbohydrates, which increase the excretion of chromium in the urine. Chromium is involved in the mechanisms of satiety, thermogenesis, and hence - control over food consumption), manganese (its sufficient amount contributes to the normal production of insulin, regulates the process of glucogenesis), nickel (according to some data, it can affect the duration of insulin, thereby reduces the load on the pancreas). Most other DD classes are available in a limited range. At the same time, the expansion of the range of mineral supplements involved in the regulation of many physiological processes, open the possibility of prevention and correction of the patient's condition in those virgin areas, where currently DD is used to a limited extent.

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