



## THE RESULTS OF A STUDY OF THE RANGE AND AVAILABILITY OF DRUGS USED IN THE TREATMENT OF STREPTODERMA IN UKRAINE

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### Abstract

Streptoderma is one of the most common dermatological diseases. The issues of organizing effective treatment of Streptoderma are of particular relevance in pediatric practice, as well as in chronic patients. A rational choice of drugs on the pharmaceutical market is of great therapeutic importance in organizing the treatment of patients with streptoderma.

**Aim:** to conduct a study of the modern assortment, as well as the availability of drugs for the population, which are used in the treatment of streptoderma in Ukraine

**Materials and methods.** The data of the information retrieval system "PharmXplorer"/"Pharmstandard" of the company "Proxima Research", instructions for drugs used in the treatment of streptoderma and the relevant regulatory framework were studied. It were used the general theoretical (historical, logical, comparative, graphic, hypothetical-deductive, etc.), mathematical and statistical methods and scientific approaches used in organizational, economic and marketing research conducted in pharmacy.

**Results and discussion.** It was found that half of the range of drugs are presented in the form of ointments (51.90%) and are imported (55.70%). In this segment of the drug market, the European vector in the formation of the range is clearly traced (81.81% of the number of imported drugs). Most drugs contain up to 3 components (65 drugs or 82.29%). One third of the range is formed by single-component drugs (28 drugs or 35.44%), and the smallest number of drugs is represented in the group of multicomponent drugs (14 drugs or 17.72%). It was found that with the increase in the number of therapeutically active substances in the composition of drugs, the share (%) of drugs of imported production gradually increased (from 42.86% - single-component to 71.43% - multicomponent). The vast majority (77.04%) of the range of drugs are represented in low and medium cost groups of drugs. This is an important positive, from a socio-economic point of view, characteristic of this range of drugs. It is proved that in the group of low-cost drugs more than (62.80%) half of the assortment items are represented by domestic manufacturers. At the same time, the largest share (%) of drugs of imported production is represented in the group of average-value (68.09%) trade names of drugs.

**Conclusions.** It was presented the features in the formation of the range of drugs that used in the complex treatment of streptoderma, it allows to qualitatively characterize this segment of the pharmaceutical market in Ukraine and to identify promising areas of development and implementation the new names of drugs.

**Key words:** bacterial skin lesions, impetigo, combined treatment of streptoderma, marketing analysis, streptoderma, pharmaceutical market.

## Introduction

Despite the significant achievements, the issue of effective treatment of infectious diseases is becoming increasingly important in medicine and pharmacy, and the search for new drugs that will provide a fundamentally new level of medical and pharmaceutical care to patients has the great socio-economic importance. According to the literature, every year bacterial infections are becoming an increasing problem, both in terms of medicine and at different levels of organization of medical and pharmaceutical care in the national health care systems [1, 2]. The enormous socio-economic losses, which are observed as a result of loss of the health, the quality of life [3, 4], and sometimes life itself [5] in adult patients and children necessitate constant review of existing approaches to improving the effectiveness of treatment of patients with bacterial infections, including in dermatological and pediatric practice [6, 7]. According to the literature, the most common pathogens of the bacterial infections that lead to pathological conditions are streptococcus and staphylococcus [8,9]. For example, *Streptococcus pyogenes* leads to the development of pathological conditions in humans in a wide range of the clinical manifestations - from pharyngitis and mild superficial skin lesions (impetigo) to extremely severe systemic diseases [10,11]. This etiological factor determines the main direction of treatment these pathologies, namely the use of broad-spectrum antibacterial drugs [12,13]. Untimely and ineffectively treated bacterial infection on the mucous membrane or skin can further lead to serious consequences, namely the development of cardiovascular disease, sepsis, autoimmune diseases, as well as life-threatening the toxic shock syndrome in patients [8,14]. Unfortunately, the emergence of highly resistant strains of streptococcal and staphylococcal infection has become a serious problem in improving the effectiveness of the treatment of patients with pathologies caused by the bacterial pathogens. The solution to this problem is possible only if the system approach is implemented in a wide range of areas and tasks. One of the areas is the search for new; highly, effective, antimicrobial drugs [15,16]. It should be noted that this is a rather high-value

process of the investment, which can take a long time.

Therefore, it is more realistic to review the existing range of drugs that belong to different pharmacotherapeutic groups [17,18], in order to comprehensively assess the prospects for their use in the treatment of these pathologies. Defined and determined the main purpose, object and subject of our research.

## Planning (methodology) of research

The key stage for the researching was the formation of a group of the reference drugs that are represented on the pharmaceutical market of Ukraine, and are used in the treatment of streptoderma. For this purpose, the data of the protocols of medical care for patients with infectious pathologies for adults (order of the Ministry of Health of 7.06.2004 №286) and children (order of the Ministry of Health of 09.07.2004) were analyzed with all changes and additions that were adopted before January 2021. Thus, the article found that in the treatment of patients with streptoderma recommended the use of a wide arsenal of drugs, which belong to different pharmacotherapeutic groups [19,20]. In the treatment protocols for the patients with streptoderma indicate the need for broad-spectrum antibiotics, vitamins, as well as anti-inflammatory, vasoactive, immunostimulating, epithelial drugs for the topical use. It is impossible to analyze the range of drugs belonging to these pharmacotherapeutic groups, taking into account the considerable variety of drugs and their forms of release, which are presented on the domestic pharmaceutical market. Therefore, to form a group of reference drugs, it was necessary to introduce restrictive in the relation to the range of drugs research parameters. However, the use of these parameters should not affect the pharmacotherapeutic value of drugs used in the treatment of streptoderma. For this purpose, in order to form a group of reference drugs, we studied the international recommendations [21,22] and the data of the special literature, in which presents the results of clinical studies of bacterial infections in dermatological patients [23,24].

Based on the results of the analysis and systematization of the material, the following

parameters for the formation of a group of reference drugs are:

- availability of relevant international recommendations and guidelines in the composition of medicines presented in the protocol for the provision of medical and pharmaceutical care for patients with streptoderma;
- mild dosage form of drugs (ointments, creams, liniments, gels, pastes), which is convenient for consumers in the case of local treatment in an outpatient setting;
- the trade name of the medicinal product must be registered in Ukraine in the status of "medicinal product", that is, we did not consider the means presented of biologically active additives on the market;
- the instruction for the use of the drug should indicate the possibility of its use in the treatment of bacterial skin infections.

Thus, the group of reference drugs was formed by those names that corresponded simultaneously to all these limiting parameters in the marketing analysis. In our opinion, this approach allows for a focused and in-depth analysis of the range of drugs used in the treatment of a pathology. In the research, we were guided by the plan, which is presented in table 1

As we can see, it contains VII main stages, which are logically connected with each other, and the progress of work allows, in our opinion, to achieve the goal. After determining the restrictive parameters for the formation of a group of reference drugs, the next key areas in marketing research were the definition of the main criteria's for analyzing the range of drugs. The use of these criteria's in research will allow us to give a scientifically grounded characterization of the segment of the pharmaceutical market that we studied. So, we have defined the following criteria's:

- dosage form (ointment, liniment, paste, cream, gel)
- origin of the drug with manufacturing firms (domestic or imported drugs);
- mono- or multicomponent composition of medicinal product;
- conditional price group (low-cost, medium-cost and expensive drug groups), in which drugs are presented

## Methods

The object of research was the process of providing medical and pharmaceutical care to patients with streptoderma in an outpatient setting. The subject of the analysis were the following data: the protocol of medical care for patients, approved by the Order of the Ministry of Health of Ukraine "On improving dermatovenereological care for the population of Ukraine" from 07.06.2004 № 286 (with changes and additions); protocol for providing medical care to patients, approved by the Order of the Ministry of Health of Ukraine "On approval of protocols for diagnosis and treatment of infectious diseases in children" dated 09.07.2004 №354 (with changes and additions); the information search system "PharmXplorer"/"Pharmstandard" of the company "Proxima Research"; instructions for drugs used in the treatment of streptoderma; special literature, including abroad recommendations and guidelines for the treatment of bacterial skin diseases.

Research of the assortment of drugs, which were presented on the domestic pharmaceutical market were conducted for the period from September 2020 to March 2021. Conditional price groups were determined by calculating the values of the average chronological retail price by the formula  $(\bar{U} = (x_1: 2) + x_2 + \dots + x_{n-1} + (x_n: 2)) : n - 1$  (conditional mark in the analysis of Rts.ser.) [25]. To determine the numerical range of values of the three price groups in which the drugs were presented, we used equal intervals, and their step was determined by the formula  $h = (\text{MaxRts.ser.} - \text{MinRts.ser.}) : n$ , where  $n$  is the number of expected drug ranking groups [25].

In order to effectively achieve the stated purpose of the study at different stages of applied research, we used general theoretical (historical, logical, comparative, graphical, hypothetical-deductive, etc.), mathematical and statistical methods and scientific approaches used in organizational, economic and marketing research conducted in pharmacy. All the necessary statistical data processing was performed by using the modern licensed software (StatSoft. Inc., 2014; STATISTICA version 12.7, May 2015), also

standardized tables of variation statistics. A value of  $p < 0.05$  was considered statistically significant.

## Results

According to the research, we found that the group of reference drugs included 79 trade names, which taking into account all forms of release offered by manufacturers, was equal to 122 drugs. The results of the analysis of drugs used in the treatment of streptoderma are presented in Fig. 1. As you can see, the dominant position in the range of drugs belong to drugs in the form of ointments (41 drugs). In the second position by the number of presented trade names of drugs are creams (14 drugs), and in the third - gels (12 names of drugs).

The next important characteristic of the range under study is the insignificant dominance of imported drugs in the range of values. Thus, their share (%) was equal to 55.70% (44 trade items excluding all forms of production), and Ukrainian production, respectively, equal 44.30% (35 items of drugs excluding all forms of production). The distribution of the range of drugs in accordance with the countries of origin is shown in fig. 2. The European vector (81.81% of imported drugs) in the formation of the range of drugs used in the treatment of streptoderma in an outpatient setting is noteworthy. The top three countries in terms of the number of drugs presented were occupied by: Poland (9 types of drugs or 20.46% of imported and 11.39% of the total range of drugs); India and Germany (8 drugs each, equal to 18.18% and 10.13%, respectively); Bulgaria (4 drugs or 9.09% and 5.06% respectively).

It is necessary to notice that for the countries of producing drugs, this market segment is differ by the lack of drugs from the countries of the former USSR. We believe that in terms of consumer and price characteristics, this market niche has been completely filled by domestically produced drugs. It should be noted that the domestic range of drugs used in the treatment of streptoderma are represented as powerful companies (CJSC SPC "Borschagivsky HFZ", FC LLC "Health", PJSC Pharmaceutical Factory "Viola", PJSC "Khimpharmzavod" Red Star ", etc. etc.) and firms with much smaller production volumes, for

example, JSC "Lubnipharm" and pharmaceutical factories that operate in some regional centers of the country.

According to the analysis of the composition of drugs, we found that most drugs contain up to 3 components (65 drugs or 82.29%). The positions of market leaders are maintained by one-component drugs, most of which are domestically produced (Fig. 3). Thus, the proportion (%) of drugs of this composition was equal to 35.44% of the composition of the group of reference drugs. 21 (26.58%) the drug contained 3 components, 16 (20.25%) names had only two therapeutically active substances. The least (14 drugs or 17.72%) was presented on the market of multicomponent (more than 3 therapeutically active substances in the composition) drugs.

As we can see from figs. 4 with the increase in the number of therapeutically active substances in the composition of drugs, the proportion (%) of imported drugs gradually increased, namely from 42.86% (single-component drugs) to 71.43% (more than three components drugs)

The next stage of our research was to analyze the range of drugs in accordance with their price characteristics. Thus, all drugs, taking into account the forms of release (122 range items) in accordance with the values of Rts.ser. were divided into three groups (low cost, medium cost and high cost). Thus, the conditional group of low-value drugs included those trade names that had the value Rts.ser., Which ranged from UAH 28.73 to UAH 101.06. In the group of medium-priced were presented drugs that were important Rts.ser. from UAH 101.07 to UAH 173.39, and for high-value ones - from UAH 173.40 to UAH 245.72 (Table 2).

According to the table. 2. The largest number of drugs was represented in the group of medium-cost drugs (41.80%). Drugs from the low-cost group (35.25%) were represented by a small margin in the second position in terms of the number of assortment items. Almost every fifth drug from the group of reference drugs was classified by us as high-value, that is, those whose values ranged from UAH 173.40 to UAH 245.72. The distribution of drugs by origin in accordance with their price group is presented in Fig. 5. It is not impossible to note the following characteristics of the range of drugs under study, namely - the dominance of drugs of imported

origin in the groups of medium and high cost drugs. At the same time, the domestic drugs significantly prevailed in the group of low-cost drugs. Thus, their number exceeded the range of imported drugs by 1.68 times.

### Discussion

The organization of effective treatment of the bacterial skin infections in conditions of increasing resistance to pathogens requires constant review and updating of the arsenal of drugs used in dermatological and pediatric practice [26,27]. In addition, the treatment of patients with streptoderma and other infectious skin diseases should be carried out comprehensively, taking into account the peculiarities of the pathology of the particular patient, the level of his compliance, financial capabilities and so on. [28,29]. In light of this statement, it seems logical to have a wide range of drugs on the domestic pharmaceutical market, which can be recommended in the treatment of the bacterial skin infections in an outpatient setting. At the same time, according to the results of the analysis of range of the group of reference drugs we found the following qualitative characteristics of the market segment under study:

- more than half of the range of drugs is presented in the form of ointments (51.90%);
- a slight prevalence of drugs of imported production (55.70% or 44 trade names excluding all forms of production), which are mostly represented by European companies. The share (%) of drugs of Indian production is only 10.13% (8 trade names excluding all forms of production);
- the top three countries representing imported drugs are: Poland (9 drugs or 11.39% of the total range of reference drugs without all forms of release); Germany and India (8 drugs or 10.13% respectively); Bulgaria (4 drugs or 5.06%). We believe that the segment of imported drugs is highly segmented by the number of drugs presented by manufacturers;
- in the domestic segment of the drug's market (35 drugs or 44.30%) are represented by both powerful pharmaceutical companies and firms that differ significantly from them in terms of production and have mainly regional influence on

the formation of the range of drugs represented in the pharmaceutical market;

- one third of the range in the group of reference drugs is represented by single-component drugs (28 drugs or 35.44%), and the smallest number of drugs is represented in the group of multicomponent drugs (14 drugs or 17.72%);
- it was found that with the increase in the number of therapeutically active substances in the composition of drugs, the proportion (%) of imported drugs gradually increased, namely - from 42.86% (single-component drugs) to 71.43% (more than three components in the composition);
- according to the price analysis  $\frac{3}{4}$  (77.04%) of the range of drugs of the reference group were referred to low and medium cost groups of drugs, which is a positive, from a socio-economic point of view, a feature of the range of drugs under study;
- It is important that in the group of low-cost drugs more than (62.80%) half of the assortment items are represented by domestic manufacturers. At the same time, the largest share (%) of imported drugs is represented in the group of average-value (68.09%) trade names. These features in the formation of the range of drugs used in the complex treatment of streptoderma allow, in our opinion, to qualitatively characterize the relevant segment of the pharmaceutical market in Ukraine and identify perspective areas of development and implementation of new names of drugs.

### The research limitations

Systematization of the results of the research allowed us to identify the following limitations. First, in developing a plan for applied research, it is necessary to clearly understand its purpose in order to form a group of reference drugs in accordance with the objectives of the work. As mentioned earlier, this group was formed by us using a set of limiting parameters. The use of different sets of such limiting parameters can lead to a significant shift in the research results and the formation of inadequate conclusions. Second, the pharmaceutical market is the heavy system that is actively developing in a wide range of areas [30,31]. Therefore, in order to fully assessment its development in different segments, it is necessary to conduct a comparative analysis of quantitative (trade names, both without and taking into account the forms of release) and qualitative characteristics

(ratio of domestic and imported drugs, dosage forms, price characteristics, manufacturers, etc.) in dynamics of changes in time. Therefore, the results of research presented by us can be considered only as components the process of analysis of the dynamics development of the market segment of drugs used in the complex treatment of streptoderma. Third, given the fact that in the market segment under study more than half of the assortment items are represented by imported names of drugs, and their value depends on fluctuations in the national currency, the price analysis in UAH limits the practical use of the results. So, in the future, we consider it necessary to conduct a price analysis of the range of drugs in US dollars.

#### Prospects for further research

According to the analysis and systematization of the obtained research results, as well as taking into account the limitations that we have outlined above, we can identify the following areas of promising research in this area:

- the assessment of socio-economic affordability of drugs using such indicators as price liquidity ratio, solvency adequacy and availability of medicines;
- the analysis of price characteristics of drugs in UAH and US dollars in the dynamics of changes in time parameters of research;
- comprehensive assessment of the possibilities of development and introduction to the pharmaceutical market of new names of drugs using the results of targeted marketing analysis.

#### Conclusions

The increase in epidemiological indicators characterizing the population profile of the bacterial skin pathologies in adults and children [29,32] against the background of restrained and therapeutically balanced attitude to antibiotics [16,17] necessitates the formation of scientists and pharmaceutical manufacturers a new vision of the need for development and active implementation on the pharmaceutical market of new names of drugs. One of the important stages in the development of this process is a preliminary assessment of the prospects for the introduction of the future drug on the market. Therefore, the results of the research can be used in different areas and have some scientific and practical value for the

development of the domestic industrial sector in the system of the pharmaceutical supply.

#### The conflict of interests.

There is no conflict of interest.

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**Table 1** The sequence of implementation and content of the main stages in marketing research

Stages of the study	Characteristics of the direction of research and its content
I stage	The substantiation of relevance and socio-economic significance of research. Analysis of data from special literature, that presents the results of similar research in terms of relevance, and significance, and practical significance. Formation of a preliminary list of literature sources that can be used in research, their analysis and systematization.
II stage	The formulation of the purpose, outlining the object and subjects of research. In accordance with the defined purpose and taking into account the results of research in a similar direction, which are presented in the open information space, the development of the work plan and selection of a set of analysis tools and licensed products that can be used in statistical data processing.
III stage	In accordance with the developed plan of applied research of determining the group of reference drugs that are represented in the segment of the domestic pharmaceutical market and used in the treatment of streptoderma. Preliminary expert (dermatologists, pediatricians, family doctors, therapists) assessment of this range of drugs and its adjustment in accordance with the algorithms of the treatment streptoderma in the outpatient conditions, presented in the current protocols of the treatment of patients with infectious dermatological pathologies in Ukraine and abroad. Determining the areas of marketing analysis.
IV stage	The statistical data of processing and preliminary evaluation of intermediate results. Analysis and systematization of experimental data. The determination of the main characteristics and features of the development domestic segment of the pharmaceutical market in which presented the drugs used in the streptoderma treatment.
V stage	Definition of objective constraints in conducting applied research. Outlining the directions of perspective researches on the outlined subjects, including on the social and economic direction.
VI stage	The systematization of the obtained research results, the formulation of conclusions on the work, writing of article and registration of graphic material.

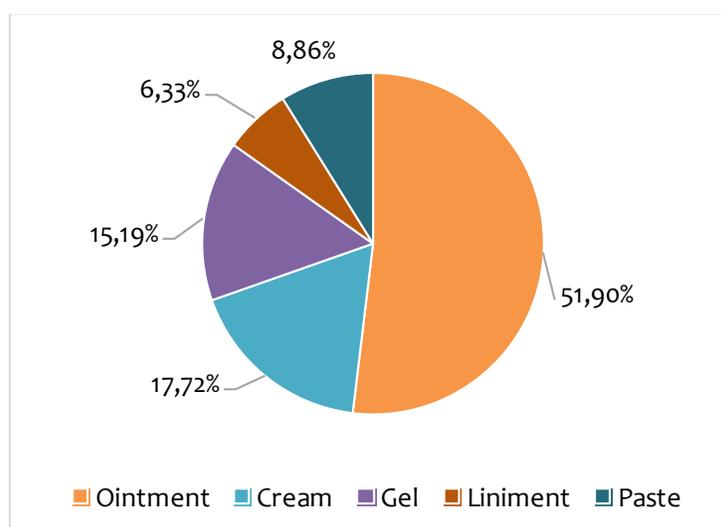


Fig. 1. The results of the distribution group of reference drugs by dosage form.

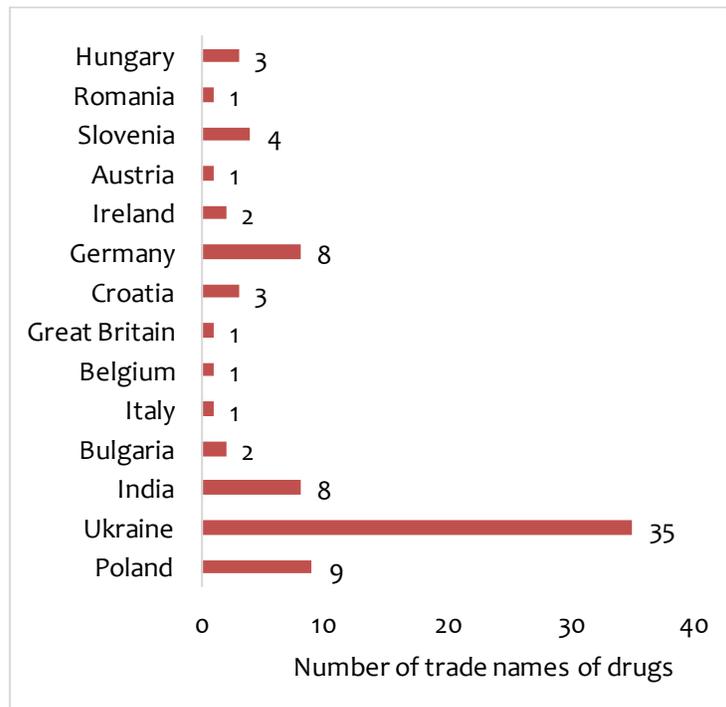


Fig.2. The results of analysis of the range of drugs by the countries of origin

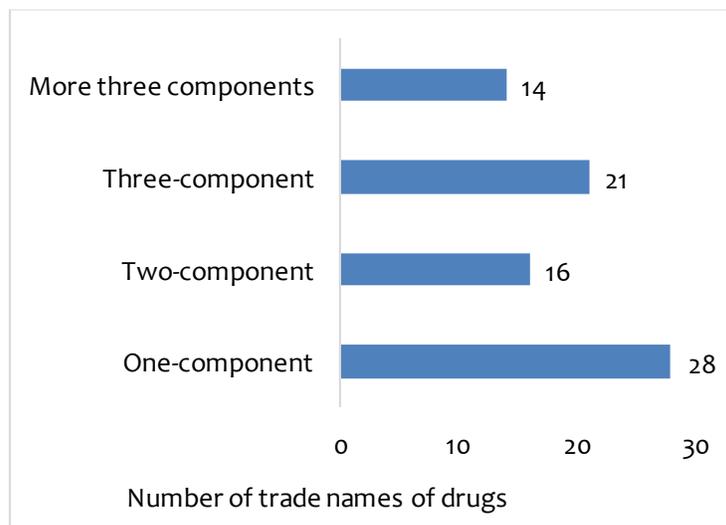


Fig. 3. The results of the distribution of drugs by the number of therapeutically active components that presents in the drug

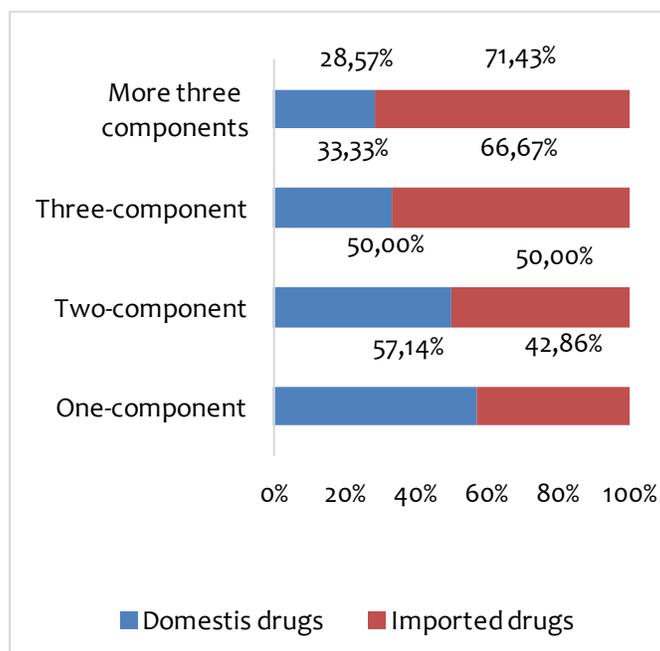


Fig. 4. The data of structural analysis (%) of the set of drugs by the number of therapeutically active components presented in the drugs and their origin (domestic or imported drug)

Table 2 The results of the distribution of drugs by price groups

Quantity and specific weight (%) of drugs according to the results of price analysis of the range		
Low cost	Medium cost	High cost
43 (35,25%)	51 (41,80%)	28 (22,95%)
Ratio (%) between drugs of domestic and imported production by price groups		
62,80:37,20	31,91:68,09	43,75:56,25

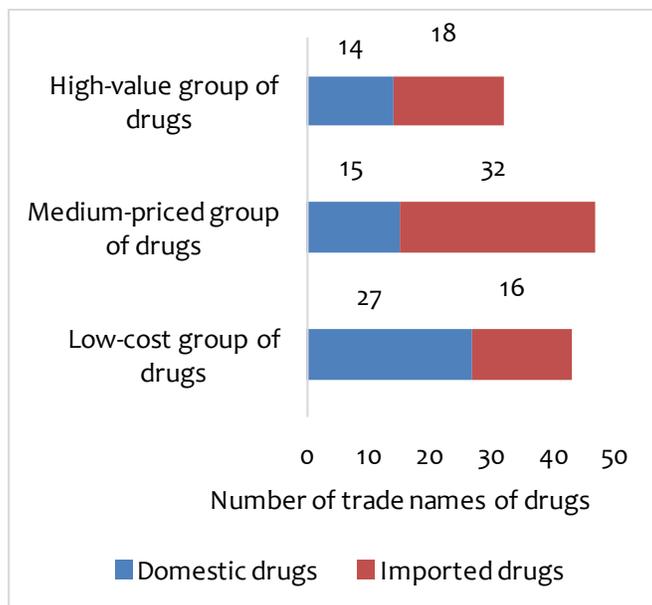


Fig.5 The results of the structural analysis of the range of drugs by price groups and in accordance with their origin (domestic and imported drugs)